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PUBLISHER'S REMARKS By Wayne Green

Wayne Green Sells Out

I Can Explain . . .

In a way, I suppose that you might say that I sold out, but I plead guilty with an explanation.

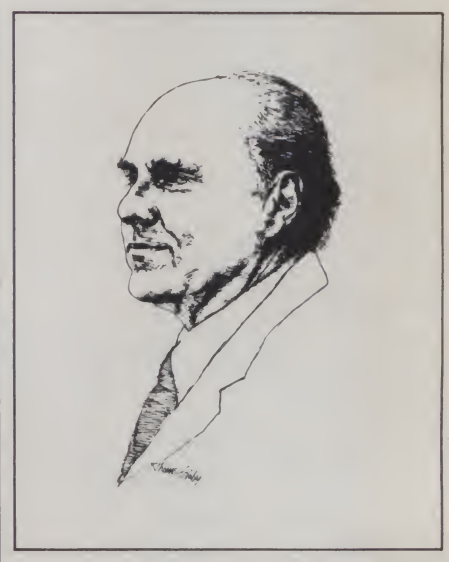
It all started this last spring when some chaps from one of the bigger banks called saying that they had a large foreign publisher who was looking to acquire something like my micro publishing empirette. I wasn't much interested because I enjoy what I'm doing more than anything else I can imagine. But what would it cost to listen, right?

So they came to visit and looked over our place. I showed them our growth in sales, which has run around 50 percent a year for the last eight years. They mumbled vaguely about $50 million, which I have to admit got my attention. I'd really never given much thought to what the whole mess might be worth.

The word that I was thinking of selling began to spread, and new suitors started calling every few days. The more I talked with these firms, the more I realized that this probably was a good time to merge with a larger firm so that I would have the money to invest in some new projects. I have never had much of a personal need for money, so selling out for a big bundle of cash had little attraction.

No, it would be worth merging if I could get the money to start magazines at a faster rate and thus be able to better keep up with the needs of the microcomputer industry. And I had an idea for a new type of magazine I wanted to try out. If it worked I'd have a way to get perhaps 50 more like it going, each with expected sales on the order of $5 million a year or more.

Then there was my idea for a new type of school, a business/technical institute geared to the needs of the 80s. The more I thought about it, the more ideas for new divisions of Wayne Green, Inc., came to mind. With some cash available for getting these new businesses and publications going, we could step up our growth enormously. I did some sales projections and I could see us growing a billion in sales within ten years just on the plans already in mind.



As I talked with the firms interested in merging, I found several of them excited about my ideas and plans. I've a good record of coming up with innovative ideas in the past, so there wasn't much skepticism about my new ideas. After all, I'd had the idea to start the first magazine for micros: *Byte*. And then I started the first system-specific magazine: *80 Micro*. And I'd pioneered mass-produced software. As I talked with people, I realized that I have a pretty good track record.

The final choice of a merger partner was most difficult. Several large firms put it bluntly: they needed me and I could name my price. Now I want to tell you that is fantastic for the ego. I really wasn't into shopping around for the highest offer because the difference between $50 million and $100 million means a lot less than the compatibility of the merger. And numbers like that don't mean any-

thing anyway, they're just very big numbers.

On May 22nd I signed a preliminary agreement with Pat McGovern, the publisher of *Computerworld*, *InfoWorld*, *PC World* and 20 other computer-related publications in 18 countries. The date was significant to me because it was eight years to the day from when I called the editor of a small micro newsletter to come up and discuss starting a magazine—and we agreed to give it a try. Five weeks later the first issue of *Byte* went to the printer. Those were five frantic weeks, I'll tell you.

The merger means that we'll be able to do more promotion of our current magazines. It means we'll be able to start more magazines—and I have a bunch of them all planned out. Each magazine is going to require a staff, so we'll be needing 200 or 300 people to help out—editors, writers, technicians, programmers, people for advertising sales, typesetting, graphic arts, circulation, data processing, and so on.

Then there are a number of special projects such as my planned technical/business college. We're going to need management teams to get these projects going and run them. Most of this is going to be done in New Hampshire, but eventually we'll be growing into other areas of the country.

If you are interested in getting involved with some exciting new ideas, you should get a letter off to me telling me what you think you might be able to do. I'm looking right now for nonsmokers with a history of enthusiasm and the ability to make things happen with a minimum of supervision.

There won't be any astronomical salaries when we are starting new projects, but we will plan to make it well worthwhile for those who are the most helpful in starting the new projects.

For instance, there are a number of products that I'd like to have made in Asia and imported for sale here. I've got the contacts in Asia to handle that end, but I need the people to handle the project from the New Hampshire end—setting up the advertising, importation and distribution of the products. This should be able to grow into a substantial business by itself.

The merger means that we have a guarantee of the money we need to move ahead on as many projects as I can find teams to work on. And if we run out of projects to get started, I'll have more. I come up with an idea for a good solid project every few days.

When you think about it, by the time you put my six magazines together with those Pat is already publishing, we're a very strong combination. I think we'll be able to parlay this group into a pilot model of the college of the future or into perhaps an educational satellite television network.

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Pat is much like me—full of ideas and enthusiasm. I think we're going to really make things hum in the microcomputer field. Care to join us?

Japan's Problems

The recent Tokyo Micro Computer Show '83 was interesting in several ways, so I think the American micro industry people who missed it may have screwed up. Sure, there were a few drawbacks. It was so hot one firm was giving out cardboard fans. It was so crowded that it was difficult to see the equipment or move around. And the noise from a hundred or so young girls demonstrating computers, each armed with powerful audio systems, made it hard to talk or even think.

In addition to it being hot, packed and noisy, there was little information available in English and, to cap it, only about 20 percent of the major manufacturers were showing. So much for the bad part. Now let me get to the good news—and good it is for the U.S. micro industry.

The one big surprise for me was how little had really changed from the Japanese computer shows I visited in 1979 and 1980. Just to make sure that I really hadn't missed anything significant, I made a pilgrimage to the Akihabara section of Tokyo where there are around a thousand electronic stores and dozens of computer stores. No, I hadn't really missed anything.

How is it that, after taking over one after the other high-tech consumer industries, the Japanese have bogged down so badly in computers? Look at the success of their Epson printers, which have been driving our American printer manufacturers to distraction. Yet, possibly with the exception of the new Radio Shack 100, which is made in Japan, surprisingly little competition has developed.

There are two basic problems holding the Japanese back. The less serious of the two has been a surprising inability to cope with the problems of marketing computers in America.

The greatest problem, though, is the Japanese written language, which is just not geared to computers. The Japanese discovered the drawbacks of their written language when the typewriter first came along. A Japanese typewriter looks like a typesetting machine, with hundreds of characters. It takes years to become skilled at it.

There was some reluctance to throw out their written language and go ahead with English, as perhaps they should have when it became clear that their written characters were too much of an obstacle to progress. The price of this heritage is a dear one for them. In the computer field it has made it so that Japanese programmers first have to become famil-

iar with English. Computers are programmed in English—even in Japan.

So, unless the Japanese computer users accept the use of the very limiting KataKana character set that is used on microcomputers, they will have to use huge (expensive) computers with enormous keyboards and slow, devious keying systems. Things have bogged down, resulting in few new or surprising developments at the latest show.

After talking with some of the store owners in Japan, I'm convinced that this situation has some advantages for Americans. There doesn't seem to be any serious restriction on exporting our technology to Japan and sort of evening the score for the beating we've taken in radio, television and recording products.

They are pathetically in need of software. And they'll gladly use it even in English. That's better than not having it. We may not be able to do much with sending printers to Japan, but there are a lot of accessories that would sell very well there.

There are still a bunch of Apple computers in Japan, plus a growing number of Apple imitations. I think Apple could get back into the running if they were to work with their supporting firms to make it the best-supported of all computer systems in Asia. That's one of the more obvious keys to success.

Radio Shack has a few computer centers in Japan, plus maybe 120 or so stores. The hundreds of support products and the thousands of supporting programs that have made the TRS-80 such a success in the U.S. are not known there, so the computer is not perceived as significant as it is in the U.S.

When you consider that Japan has about half of the population of the U.S., you realize that this is not a market to be dismissed lightly. Indeed, any American manufacturer who does not make a major effort to achieve sales in both Japan and Europe is going to have long-term problems.

So, for the American microcomputer businessmen who went to Japan to see the Tokyo show, the news was heartening. The dealers on the trip were exposed to a few new gadgets worthy of being brought into the U.S. The entrepreneurs saw the potential for a whole new and very large market for American computer products.

For anyone with imagination and some enthusiasm, the trip to Japan was well worthwhile. The next such trip will be in October, and it will cost about $2500, which includes hotels, all transportation, more meals than most people should eat and entry to electronics shows in the four major Asian cities. It's a super tour. If you're interested in more on this, please drop me a line.□

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By Thomas V. Bonoma

No Ecstasy Over the XT

For the Money, Pass Up The PC "Upgrade"

Getting Personal

The introduction of IBM's XT has come and gone, and I'm disappointed. I don't see the incremental value in the XT for the price, either in utility or technology. Nobody I know has much less than a 128K system now, so providing that standard isn't more than acknowledging how buyers configure their machines.

The ten-megabyte hard disk is useful, but Davong and others have been supplying it, along with the software needed to run it, for almost a year. The color monitor is a good idea, and so is the async adapter, but again, this is how many users have configured their machines already.

At $5000 with a single disk drive and no monitor, the only upside I can see is from the "extra" expansion slots, which should have been provided in the first place.

The XT? My guess is that it was ginned up to counter the Apple's Lisa. The only really positive effects are DOS 2.0 and IBM's decision to decrease prices on the regular PC by about 15 percent.

My advice is to buy the PC, and pass on the XT for now.

KeyTronic, Apparat and Copy II PC

In the extended use report category, I've got an update on the KeyTronic 5150 Keyboard and also on the Apparat Spool/64.

The KeyTronic now looks like my factory keyboard did when I switched it out—dirty, a little stained and somewhat beat up. But it *is* a faster word processing keyboard than the factory one, once you get used to it, and the LEDs on the Num Lock and Caps Lock keys come in handy. I've grown to love this little addition, and hope to keep pounding on it for some time to come.

The Apparat Spooler has performed flawlessly, although the same can't be said of some software's compatibility with it. In at least two cases, programs attempting to dump medium-resolution text and graphics to the printer have fouled themselves in the Apparat, causing garbage to be output.

The Spooler has some control codes you can issue to put it in a "pass through" mode to avoid this problem, but the situation always occurs when you're using canned software and can't issue any codes. Other than that, the Apparat is like a garage door opener. Before you buy one, you think people who have one are a little effete and lazy; after you get it, you don't want to live without it.

Copy II PC is a copy program about which, like many outstanding programs, there's nothing much to say. I've tried to foul up this no-parameter, no-hassle program in every way I can think of, but it just keeps doing its job.

Although it doesn't like it and acts like it's running in a sludge bath, it even will copy your protected Pascal disks for you, and they'll work when it's done. If you're hassled by copy-protection schemes and licensing agreements that seem to make you a criminal just because you'd like to make sure you don't lunch a $1000 disk, this program will be useful.

BPS Business Graphics System

Graphics aren't just exploding on the PC; they're positively bombarding users. A revision 2 of Chartman will be released shortly; it supports typeset-like output on the HP plotter. Fast Graphs version 1.10 has been released, with much-needed speed improvements in the graphics print routines (but still with woodpecker-like plotter routines that defy all of Mr. Hewlett's efforts to make his machine usable). And BPS Business Graphics has appeared on the scene.

I'd like to spend a little time with you on this last one, since it's a significant product with a lot of plusses and some minuses.

The BPS system runs under Network Consulting's Pascal, and it's an interactive graphics-generating system. If you have two screens, you tell BPS what you want on the monochrome screen and see the pretty pictures on the color monitor. (When I say interactive, I *mean* interactive.) You give commands like "Plot axes," and the package does it.

Data entry is easy, and the program doesn't even care if the data is made up of numbers or labels. That means "High High" and "Low Low" are perfectly valid data pairs that will be "plotted" on the screen, giving you an empty 2×2 matrix you can fill in yourself.

BPS, veterans of Apple graphics programs, have taken the "we support all peripherals" approach in their program design. You name the plotter, matrix printer or daisy wheel and BPS supports it.

This breadth of support, however, means some complexity in printing graphs. BPS distinguishes between devices that accept screen dumps, like the Epson, and ones that have their own line-drawing, characters and other routines, like plotters. This means that your Epson is a "draw" device, your HP-7470A is a "set" device and your NEC Spinwriter is either a draw or a set device.

Using the screen dump devices is easy . . . you just say "Write Screen" types of things and there you are. Using set devices isn't so easy, since the program draws differently on the screen and the plotter. That's not very useful for interactive graphics; it means, in effect, you've got to generate the screen graph, save the commands that made it, set up your plotter and the program, and then regenerate it to get the plot.

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Command Echoes

Speaking of saving commands, BPS has what it calls "take files," which are echoes of the commands you type on the screen or ones you save for graph generation. This feature is handy for regenerating graphs, for making "slide shows" (supported by BPS) or for automatically configuring the program on start-up to output to a certain device.

The screen graphics are faster than MBA's, but slower that 1-2-3's, which is to say they're quite acceptable. Color choice is completely programmable, but the program will manage it automatically as well.

BPS does have restrictions—like the ability to work with only one data set at a time (multiple bar graphics, for example, requires a Plot, Load, Plot, Load sequence for each set of bars to be made). There are bonuses, too—like an Interchange command (not very friendly, but at least it's there) to transfer DOS files into BPS's own language, so you can use VisiCalc to do things and BPS to plot them.

Best, perhaps, is the set of business statistical manipulations, from which BPS takes its name. You can run a regression, do curve-fitting, estimate points into the future, smooth data exponentially or with a moving average, and arithmetically manipulate a data set (e.g., Multiply By 3.03) in any way you'd like. This is a powerful package.

The manual is nicely done, with example graphs, a tutorial, a reference section and a lot of space devoted to the peripherals supported by BPS, including cabling requirements. A disk of sample files is provided, and the program has online help should you forget a command while working.

If BPS would just restrain itself from falling in love with differences in peripherals (e.g., set vs draw) and give the user some consistent ways of getting the output off the screen, I'd be hard-put to criticize this package. As it is, it's good, but could be a whole lot friendlier on the print side of the street.

Datafax, PFS:file/report, Easyfiler

When David Guest of PowerText told me to review DataFax, I was skeptical. Who needs to look at another database? And, who needs to look at one in Pascal, which makes *DOS* compatibility a problem?

David's a pretty good judge of character, though, and he told me that DataFax's unstructured style of letting you type, mark keys and store free-form text was suited perfectly to my academic personality and data needs. He wasn't far wrong.

The folks at Link Systems have done a fine job in creating a "formless" DBMS that's simple, quick and powerful. With DataFax, you just select what you want to do from a menu, define a new folder and type away to your heart's content.

Want to store an article you've read? Just type in how you feel about it, mark as keys any words you'd like and store it. You then can retrieve any marked keys with Ands, Ors or any combination of these techniques in sorted or unsorted order.

It's a way for those of us who read marketing journals, computer magazines and classics to keep everything in one crammed and dusty file cabinet, just like we'd do in real life. The difference is, with DataFax, you can find it again.

Date-Handling

The program also handles dates well; it doesn't insist, for instance, that dates are strings or otherwise meaningless. Handling dates is about the only quantitative skill the program has, though; as the manual states, if you want numbers, go buy VersaForm or dBase.

The manual, by the way, is good, despite being a little disjointed in places. I was impressed that, after three weeks of reasonably solid use, I had managed to fill only 7.5 percent of a double-sided disk with my ramblings, article synopses and other tomfoolery.

I always like it when program authors know what their software can't do. I like it more when programmers take into account that the user may make mistakes—like running out of disk room. DataFax has some commands (Load and Unload) that let you split your database if it becomes too big, and also has made provision to get your base over to a hard disk if that becomes necessary. They've also, thoughtfully, included a "backup" command from the menu to nudge you gently toward that good practice.

Another big advantage is that the program lets you configure the PC function keys (and all the other ones) that drive what it does, in a fully custom way, to your desires. Want F10 to be the "key mark" key? Easy.

Drawbacks. . . . Well, let's see. If you have a database of authors, titles, years and journals, there's no good way to split out just the author-type keys—unless you're willing to prefix them in some way, such as with a letter (AJones. ASmith, ASzacks). The key problem could be important, depending on what you'll do with your data. Depending on that and, I guess, what you do for a living, this may be an important program for you.

PFS:file and PFS:report

PFS:file and its sister program, PFS:report, first impress you as a package not worth further examination. They're packaged and sold separately, which makes it seem like Software Publishing Company has discovered the marketing principle of "unbundling," in which it splits one filing/report program into two to get more money.

The programs come in boxes that look like the ones you have in your sock drawer that contain all sorts of useless stuff. The documentation seems thin for any complex program, although it includes plenty of pictures and it's clearly written. And, the spiral-bound Apple II style of doing things betrays the program's origins and makes the potential purchaser wonder what it is he's getting.

If you get past these initial impressions, however, you'll be positively surprised. PFS:file is a semi-forms-oriented DBMS that offers the user a lot of flexibility for the money. Forms design is a matter of just typing headings and colons: no spacing out, defining of field lengths or even specifying of field types.

Want to write "some stuff" in a field called "Comments:"? Just leave a few lines, and write away. The program automatically splits your text into whole words at line endings, so you aren't hyphenating or racing the cursor to the line end.

Want to put "$1,022.33" in the Salary field? Do it. Then go ahead and use numeric search-and-manipulation criteria. No trouble, although sorts and searches are slow without a hard disk.

So, what you get is a semiform kind of DBMS. Type in some field headings anywhere on the screen (up to 31 pages of screens per record), and go to it! As things should be in this world, the program worries about whether it has a numeric, alphabetic or date format, and acts accordingly when you want to retrieve. That's clever.

Also, there's no need to keep thinking, "Well, my comments field is only 90 characters long . . . how do I say this?" Just leave some room when you design (or redesign . . . there's a good facility for this), and go to it.

Although PFS:file is not billed as a report generator, its File program does let you do some extraction, including mailing labels, sorts and field inclusion/exclusion from forms. No, it won't head reports and won't worry about column widths, but it will get simple reporting jobs done.

The file program uses a lot of disk space to hold the records; four records of moderate length chewed up almost 17,000 bytes. You pay for the entry flexibility, especially if you're long-winded like me.

The report program, to my mind, is not as well-done as the filer. You can't simultaneously define an extracted field as numeric (so you can manipulate it in some way) and get formatting like dollar signs on the output. You can, though, total, subtotal, average, subaverage, count and break the report by key or field as you will, all with single-key specifications. Derived columns on the report are a snap: formula entry is simple and straightforward.

Documentation

Both PFS packages have outstanding

documentation, which, like all good writing, looks thin at first glance. Backups of each program are supplied with the package, as are utilities to configure a serial printer and to convert the programs to hard disk operation.

These little thoughtful touches are appreciated; so is the catalog of error messages producible by the program, and so is the glossary of DBMS terms. No modifications or provisions have been made to run in color monitors, so color operation is a faded dream of possibilities.

IUS's EasyFiler

EasyFiler, from Information Unlimited Software, was reviewed by me in an earlier column on database programs. I thought it was strong then on the basis of its report and data-entry routines, but I had some harsh words for it because it ran only under a customized DOS that defeats the whole purpose of DBMS on the PC. Well, it doesn't anymore.

The latest release of EasyFiler inactivates the "import" facility, and just goes ahead and uses DOS for its needs. That means, of course, that EasyFiler is now hard-disk-compatible—a must with any database program (even if you don't use one right now). Also, the restriction that databases cannot occupy more than a single disk has been removed.

I certainly hope that IUS is going to upgrade all users' packages with the new disks and few pages of changes that the manual requires. Hear that, guys? When you charge $80 so that users can call you on the phone with questions about your product, be prepared to do some things in return! (The "User Assurance Plan," however, states that if your warranty card is returned, you'll be "eligible for updates at a discount." Uh-oh.)

I really like IUS's products; I think they make a quality word processor, filer and, now, spreadsheet and spelling-checker. But, this customized DOS stuff—pay-as-you-go phone support and no backups provided—is just too much to bear gracefully.

(By the way, IUS's EasyPlanner is also DOS-compatible.)

Finances: Personal and Profound

You've read my comments on the Financier personal financial programs before. For anyone who doubts that good code can be done in Basic, look at these.

The beauty of the Financier is that you can be as sloppy or compulsive as you need to be about your finances. Category definition for expenditures, budgets, taxes and the like all are up to you. Instead of conforming you to the program, it conforms itself to you.

The programs also keep an inventory of all your possessions as you acquire them, and they're well-supported, with a

```
This is a test of SIDEWAYS, a new PC-utili
ty for Graftrax-equipped IBM's
from Funk Software, P.O. Box 1290, Cambrid
ge, MA 02238.  SIDEWAYS costs
$60, and converts your PC's printer into a
 device that can output ASCII
files, including print files from spreadsh
eets, horizontally instead of
vertically.  It is copy-protected, but you
're allowed one backup.
```

Fig. 1. Sideways, a PC utility for Graftrax-equipped IBMs, allows you to print files horizontally instead of vertically.

Microcomputing Magazine

Thomas V. Bonoma
2 April, 1983

The Fancy Font System
from SoftCraft

Softcraft (8726 S. Sepulveda Blvd., Los Angeles, CA, 90045 – 180.00) recently has released its "personal typesetter" for the IBM PC with an Epson MX80 or MX100 printer with GrafTrax, called *Fancy Font. FF* comes on four single-sided diskettes, and is well, if somewhat turgidly documented. **As you can see, the system is most flexible, an permits Old English,** *a "Script" kind of type,* and a variety of type sizes, such as this Sans Serif 20-point type.

Not only is there a versatile printing program which accepts text files (this was written on *WordStar*), has on-line help, and allows your terminal to be used as an "electronic typewriter" if you'd like, but there are **font-editing and** *font-creation programs too.* The Hershey database, a character set created at the National Bureau of Standards, has been adapted by the authors to the Epson, and is included on diskette so that you can incorporate or modify it into custom fonts you build yourself.

Because it is so exacting (in final draft form, the print program prints 24 dots per character), *Fancy Font* will win no speed awards. And, since *WordStar* (or any other word processor, for that matter) doesn't worry about line heights and widths, some testing is necessary to get a clean printout. But, aside from these rather trivial quibbles, and a user's manual which has been written for CP/M machines and only modified for MS/DOS, I think you'll find *Fancy Font* an exceptional value for the money. As a side benefit, you can't read the manual without learning a good deal about character generation as well.

Because it comes on so many disks, you'll probably want to customize your version of *Fancy Font* so that the program can find the fonts you use most often. With double-sided drives, this is no problem, as everything fits on two diskettes. And, a print spooler, either in hardware or software, could significantly lessen the time you're staring at the Epson, waiting for it to complete the sixth pass on a row of text.

I think that some of the smaller quantity jobs than straight word-processing of documents is where Fancy Font really shines. For instance, run it from **WordStar** and viola!, instant letterhead which you can then print your letter on. Or, use it to address envelopes (the print program accepts substitution stings, so that you can fill in names and addresses while the program is running one file over and over again. Disk labels are another idea. I guess what I'm trying to say is that, while I wouldn't want to use *Fancy Font* to print my letters, I intend to use it a lot for short-run, "special occasion" printing where the appearance of the printed output (e.g., a resume) is critical to the reception a document will get. Try it out.

Fig. 2. Sample printout from SoftCraft's Fancy Font System.

tutorial, full disk-based files on a fictional family and solid documentation.

Actually, it's not the financial programs I want to tell you about; it's the Tax Series. This set of programs interfaces with the financial ones, so you can use the Financier monthly, for instance, and then use the tax program at the year's end without as much as one redundant data entry in order to compute, manipulate and otherwise "constructively avoid but never evade" your tax burden.

The tax program also stands alone, and it's so powerful that many professional tax firms have been buying it to resell to clients. If you have enough money to have tax problems, take a look at the Tax Series.

Moving from the profane to the profound is Ashton-Tate's newest entry, Financial Planning Language.

FPL is Ashton-Tate's answer to Ferox's Micro/DSS; it's intended to help business users compile profit-and-loss statements, do cash flow management and the like.

My impressions from a quick tour are that FPL is a little more friendly than Micro/DSS in operation, and definitely more friendly in documentation. While FPL does not support on-board graphics as does DSS, it does have such conveniences as on-line help for editor commands and an easier report-generation specification routine. Like all Ashton-Tate products, it is supplied with a demonstration disk that can be opened at no risk to your future rights to return the package if it won't do what you want. It's also supplied with a program disk that shouldn't be opened until you know FPL is for you. That alone, in my mind, is enough to make you try this one before plunking down your money on any financial modelling system.

Lately, Ashton-Tate has been making some moves in the business market (e.g., The Bottom Line Strategist), and, while none of these recent entries have the enduring characteristics (or the awesome complexity) of dBase II, they do uphold Ashton-Tate's quality image.

Briefly Noted

Two good printing utilities are Sideways and The Fancy Font System. Both do what they say (see Fig. 1 and Fig. 2).

Basic Programming Tools is a collection of a program editor, a number/unnumber utility, a remark stripper and a lister, all running under Basic and all integrated from a central menu. The editor especially is welcome; it accepts programs without line numbers and with labelled gotos and gosubs (e.g., Goto Charlie), and then translates them into numbered and correctly directed code segments.

This system is quite useful, but not in the same "don't leave DOS without it" category as the Basic Development System you've read about here before.

The "Big Blue" Black Book

Prices, Addresses of This Month's Featured Products, Companies

BPS Business Graphics ($350)
Business & Professional Software, Inc.
143 Binney St.
Cambridge, MA 02142

Basic Programming Tools ($120)
Synergistic Software
830 N. Riverside Drive
Renton, WA 98055

Chartman (I—$380; II—$425; III—$199)
Graphic Software, Inc.
PO Box 367
Kenmore Station
Boston, MA 02215

Cyborg ($34.95)
Sentient Software
PO Box 4929
Aspen, CO 81612

DataFax ($299)
Link Systems
1640 19th St.
Santa Monica, CA 90404

EasyFiler ($400)
EasySpeller ($125)
Information Unlimited Software, Inc.
2401 Marinship Way
Sausalito, CA 94965

Fancy Font System ($80)
Softcraft
8726 S. Sepulveda Blvd.
Los Angeles, CA 90045

Fast Graphs ($295)
Innovative Software, Inc.
Suite 380
9300 W. 110 St.
Overland Park, KS 66210

Financial Planning Language ($700)
Ashton-Tate
9929 W. Jefferson Blvd.
Culver City, CA 90230

The Financier ($125)
The Financier Tax Series ($125)
Financier, Inc.
2400 Computer Drive
Westboro, MA 01581

Frogger ($34.95)
Sierra On-Line, Inc.
36575 Mudge Ranch Road
Coarsegold, CA 93614

The MBA ($695)
Context Management Systems
23864 Hawthorne Blvd.
Suite 101
Torrance, CA 90505

1-2-3 ($495)
Lotus Development Corp.
161 1st St.
Cambridge, MA 02142

PFS:file ($140)
PFS:report ($125)
Software Publishing Corp.
1901 Landings Drive
Mountain View, CA 94043

Peeks 'n' Pokes for the IBM PC ($30)
Data Base Decisions
14 Bonnie Lane
Atlanta, GA 30328

PowerText ($399)
Beaman Porter, Inc.
Pleasant Ridge Road
Harrison, NY 10528

Random House Proofreader ($50)
Aspen Software
PO Box 399
Tijeras, NM 87059

Sideways ($60)
Funk Software
PO Box 1290
Cambridge, MA 02238

VersaForm ($389)
Applied Software Technology
14125 Capri Drive
Los Gatos, CA 95030

On games, we have Cyborg and Frogger. The former is a text adventure set in a space environment; the latter is a well-done game involving frogs you attempt to move across a road and a shark- and snake-infested stream—home to the lily pad. Frogger is good with kids for hand-eye coordination development, but will pale quickly with adults.

Peeks'n'Pokes, for the IBM PC, has a host of short programs showing you how to get at the innards of your machine in both Basic and Pascal. With its 50 programs, you'll learn to access your system's hardware configuration, unprotect Basic programs, read and change keyboard and monitor status, read disk status and the like. Several stand-alone programs are given on the disk, but the idea is to give you routines you can put in your own programs.

Finally, The Random House Proofreader, essentially, is the proofreader of Proofreader/Grammatik fame, but it's updated with an outstanding new dictionary. If you've got auxiliary dictionaries developed for other spelling checkers, they should work with this, too. Wait until you see the electronic thesaurus that's coming soon.

Preview

Ever wonder why so many of the best software packages (e.g., The MBA, PowerText, DataFax,) operate under Network Consulting's Pascal implementation, and not either of the ones available from IBM? Next month, we'll peel that particular onion and look at the core of the Pascal system as implemented by NCS. We'll also celebrate our first anniversary together, and we'll have an array of software reviews as usual.

Wordnew4.bas

I don't have enough room to do Wordnew4.bas program justice, but Listing 1 is a modification of a program I hoped to run a couple of months ago but which was cut for space reasons. What happened is that I mailed this program to my reader and pen-pal Peter Baenziger, and he "got to playing" with it. He sent it back much improved, and with a wish it would work on both color and monochrome monitors.

I got to playing with it, too, then he played again, and so on. The result is the final program, Wordnew4.bas, useful on any monitor. Pay particular attention to how Baenziger worked the screen switch routines (very clever, Peter!), and to our joint efforts at automatic monitor configuration.

Hope you like it. As usual, if you don't want to key it in, send me a disk and $10 and I'll return it chock full of programs published here, including this one. Full documentation for Wordnew4.bas is included.□

Listing 1. Wordnew.bas—a word frequency analysis program adapted by Tom Bonoma and modified by Peter Baenziger.

```
10 ' Program:  Word Frequency Analysis          DSK:  Hard D:
20 ' Purpose:  Word frequency analysis, IBM PC version
30 ' Source :  Grillo/Robertson, Data Management Techniques, Pp. 64-66
40 ' Adapted:  T. Bonoma                        Date: 12/82
50 ' Modified by Peter Baenziger                Date: 03/83, 04/83
60 ' Remodified for both adapters/color by Bonoma
70 '
80 DEFINT A-Y:DEFSNG Z:OPTION BASE 1 ' All integers, except for statistics variables starting with Z
90 WIDTH 80: WIDTH "LPT1:",255
100 KEY OFF:CLS
110 BUFFERSIZE=500 ' Size of text buffer
120 DIM T$(BUFFERSIZE), FREQ(101), CHECK$(7), SCALE(7) ' FREQ is 101 to have an empty member for MODE.  CHECK$ and SCALE, see belo
w
130 CHECK$(1)=",":CHECK$(2)=".":CHECK$(3)="?":CHECK$(4)="!":CHECK$(5)=":":CHECK$(6)=";":CHECK$(7)="-" ' Those are the punctuation
marks we don't want to count
140 SCALE(1)=1:SCALE(2)=2:SCALE(3)=5:SCALE(4)=10:SCALE(5)=25:SCALE(6)=50:SCALE(7)=100 ' Scale factors for the bar graph, nice roun
d numbers
150 TXTBASE=8:MAX=20:GRAPHBASE=22:STATBASE=GRAPHBASE-(MAX+1) ' Y or line count origins on screen for various purposes, MAX is the
largest frequency at SCALE=1
160 COUNT=0 ' COUNT is used in cursor movement
170 '
180 GOSUB 2800 ' Determine whether color graphics adapter, monochrome or both
190 IF CGA=FALSE THEN 250 ' No further set up needed for monochrome adapter
200 SCREEN 0,1,0,0 ' Select color screen for CGA
210 MENU=0:TYPE=1:GRAPH=2 ' Screen numbers for color graphics adapter. GRAPH flips between 2 and 3
220 FOR SCR=1 TO 3:SCREEN ,,SCR,MENU:CLS:NEXT:SCREEN ,,MENU,TYPE ' Clear 3 of 4 text screens
230 '
240 ' ---- Return point for monochrome adapter ----
250 ON ERROR GOTO 0:CLS ' Turn off error trapping, some routines return with it enabled
260 GOSUB 2570 ' Print heading
270 IF COLR THEN FG=(FG+3) MOD 7:BDR = (BDR+2) MOD 15:COLOR FG,0,BDR ' Foreground (text) and border colors. MOD keeps the values i
n bound
280 LOCATE TXTBASE,20:PRINT "1.  Type New Text"
290 PRINT TAB(20) "2.  Store Text on Disk"
300 PRINT TAB(20) "3.  Load Text from Disk"
310 PRINT TAB(20) "4.  Tally Frequencies & Bar Graph"
320 PRINT TAB(20) "5.  Display Text on Screen or Printer"
330 COLOR 7,0:LOCATE TXTBASE+8,20:PRINT "Position ";:COLOR 31,0:PRINT CHR$(175) " " CHR$(174);:COLOR 7,0:PRINT " with cursor arrow
 up and down keys"
340 LOCATE TXTBASE+10,20 :PRINT "then press F1 to choose, F10 to end":COLOR 7,0
350 '
360 LOCATE 25,25:COLOR 7,0:PRINT "F1 ";:COLOR 0,7:PRINT "CHOOSE";:COLOR 7,0
370 PRINT "         F10 ";:COLOR 0,7:PRINT "END";:COLOR 7,0
380 '
390 ' ---- Return point for color graphics adapter ----
400 ON ERROR GOTO 0:IF CGA THEN SCREEN ,,MENU,MENU:CURSCR=MENU ' Makes MENU the visible screen
410 GOSUB 570 ' Print a blinking marker
420 KEY(11) ON: KEY(14) ON:KEY(I) ON:KEY(10) ON ' Turn the 4 interrupt keys on
430 ON KEY(I) GOSUB 490:ON KEY(10) GOSUB 670 'F1 and F10 keys
440 ON KEY(11) GOSUB 550: ON KEY(14) GOSUB 610 'Cursor Up and Down Keys
450 '
460 POKE 106,0:K$=INKEY$:GOTO 460 ' The waiting for input loop, it's POKEing 106 to clear the keyboard buffer of unwanted "stored"
 keys
470 '
480 ' ---- F1, the "Choose" key interrupt routine ----
490 LOCATE TXTBASE+COUNT, 15: PRINT CHR$(32);:LOCATE TXTBASE+COUNT,60: PRINT CHR$(32) ' Clear the markers off
500 BEEP:KEY(11) OFF:KEY(14)OFF ' Turn the cursor interrupt keys off.  F1 turns itself off, F10 remains always active
510 ON COUNT+1 GOSUB 710,890,1110,1390,2060 ' Count marks the selection
520 IF CGA THEN RETURN 400 ELSE RETURN 250
530 '
540 ' ---- Cursor up key interrupt routine ----
550 LOCATE TXTBASE+COUNT,15:PRINT CHR$(32);:LOCATE TXTBASE+COUNT,60:PRINT CHR$(32) ' Clear old markers off
560 IF COUNT THEN COUNT=COUNT-1 ' One line up, but only if we are not at zero
570 LOCATE TXTBASE+COUNT,15:COLOR 31,0:PRINT CHR$(175);:LOCATE TXTBASE+COUNT,60:PRINT CHR$(174):COLOR 7,0 ' Print new markers, one
 line up or at same spot if COUNT was 0
580 RETURN
590 '
600 ' ---- Cursor down key interrupt routine ----
610 LOCATE TXTBASE+COUNT,15:PRINT CHR$(32);:LOCATE TXTBASE+COUNT,60:PRINT CHR$(32)
620 COUNT=(COUNT+1) MOD 5 ' Increase by one, but always keep it between 0 and 4. MOD means the remainder left after an integer div
ision by 5
630 LOCATE TXTBASE+COUNT,15:COLOR 31,0: PRINT CHR$(175);:LOCATE TXTBASE+COUNT,60: PRINT CHR$(174):COLOR 7,0 ' New markers, one lin
e down
640 RETURN
650 '
660 ' ---- F10 , then "End" key interrupt routine ----
670 IF CGA THEN SCREEN 0,1,0,0
680 CLS:COLOR 7,0,0:KEY ON:PRINT "ENDING....":END ' Reset everything to the way it was before the program
690 '
700 ' ---- Text Input routine -- load T$ array with new text ----
710 IF CGA THEN SCREEN ,,TYPE,CURSCR
720 CLS:IF COLR THEN COLOR 14,0,14 ELSE COLOR 15,0
730 FLNM$="" ' Clear any old file names
740 PRINT TAB(6) "Type up to" BUFFERSIZE "lines of text, not longer than 253 letters each" ' BASIC can handle 255, but we add a sp
ace at the end in tallying
750 PRINT TAB(6) "Type <ENTER> at end of line.  Type $$$$ to signal end of input.":PRINT
760 COLOR 7,0
770 IF CGA THEN SCREEN ,,TYPE,TYPE:CURSCR=TYPE ' Make typing screen the visible and active screen
780 LNKT=0
790 FOR I=1 TO BUFFERSIZE
800 IF I=(BUFFERSIZE\10)*9 THEN PREVLOC=CSRLIN:LOCATE 25,30:COLOR 23,0: PRINT "Buffer getting full!!";:LOCATE PREVLOC,1:COLOR 7,0:
 ' Remember where the cursor was, print a warning, then jump cursor back
810 PRINT USING "###  ";I; ' Line numbers
820 LINE INPUT T$(I) ' Get the the text
830 IF INSTR(T$(I),"$$$$") THEN LNKT=I:I=BUFFERSIZE:GOTO 850 ' Normal exit
```

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Listing continued.

```
840 IF I=BUFFERSIZE THEN ERRMSG$=STR$(BUFFERSIZE)+" line buffer is full.":T$(BUFFERSIZE)=LEFT$(T$(BUFFERSIZE),249)+"$$$$":LNKT=I:L
OCATE 25,30:GOSUB 2750 ' Print message and quit
850 NEXT
860 RETURN
870 '
880 ' ---- Text storage routine -- dump T$ to a disk file ----
890 IF CGA THEN SCREEN ,,TYPE,CURSCR
900 CLS:IF COLR THEN COLOR 14,0,14 ELSE COLOR 7,0
910 IF LNKT=0 THEN ERRMSG$= "No text to save":CLS:LOCATE 4,8:IF CGA THEN SCREEN ,,TYPE,TYPE:GOSUB 2750:RETURN ELSE GOSUB 2750:RETU
RN ' Print a blinking error message if there is nothing to save
920 IF CGA THEN SCREEN ,,TYPE,TYPE:CURSCR=TYPE
930 FRM$=STRING$(40,223):LOCATE 3,8:PRINT FRM$:LOCATE 5,8:PRINT FRM$
940 LOCATE 4,8
950 INPUT "What is the file name you'd like to use ";FLNM$
960 IF FLNM$="" THEN RETURN ' Just an enter
970 COLOR 7,0
980 IF INSTR(FLNM$,".") =0 AND ((RIGHT$(FLNM$,4)<>".TXT" OR RIGHT$(FLNM$,4)<>".txt")) THEN FLNM$=FLNM$+".TXT" ' Add a default exte
nsion .TXT if none supplied
990 ON ERROR GOTO 2640 ' Set up error trapping
1000 OPEN FLNM$ FOR INPUT AS #1 ' Check if a file with the same name exists. If it doesn't exist, it'll create an error, the error
 handling routine will skip the line below
1010 CLOSE:BEEP:LOCATE 6,8:ERRMSG$="File already exists!":GOSUB 2750:RETURN ' Yes, it exists, print a blinking error message and g
o back.
1020 '
1030 ON ERROR GOTO 0 ' This is where the error handling routine comes if there is no file with the same name
1040 OPEN FLNM$ FOR OUTPUT AS #1
1050 FOR I=1 TO LNKT
1060 PRINT #1, T$(I)
1070 NEXT I
1080 CLOSE:RETURN
1090 '
1100 ' ---- Load text from disk into T$ ----
1110 IF CGA THEN SCREEN ,,TYPE,CURSCR
1120 CLS:COLOR 15,0:LOCATE 4,8:PRINT "<Enter> returns you to main menu.":PRINT
1130 IF COLR THEN FG=(FG+1) MOD 6:BDR=(BDR+1) MOD 15:COLOR FG,0,BDR ELSE COLOR 7,0
1140 FRM$=STRING$(7,32)+STRING$(58,220):PRINT FRM$
1150 PRINT TAB(8) "Type the file name of the text you want to load or"
1160 PRINT TAB(8) "type A, B, C or D to see the .TXT file directory on that drive"
1170 PRINT FRM$
1180 IF CGA THEN SCREEN ,,TYPE,TYPE:CURSCR=TYPE
1190 LOCATE 17,8:PRINT SPACE$(71):IF COLR THEN FG = (FG+1) MOD 7:BDR =(BDR+1) MOD 15:COLOR FG,0,BDR
1200 LOCATE 17, 8: INPUT "",FLNM$
1210 IF FLNM$="" THEN RETURN ' Just an enter
1220 '
1230 ON ERROR GOTO 2680 ' Again, turn on error trapping
1240 IF LEN(FLNM$)=1 AND INSTR("AaBbCcDd",FLNM$) THEN FLNM$=FLNM$+":*.TXT":LOCATE 11,1:FILES FLNM$:GOTO 1190 ' If there are no .TX
T files, the error handling routine prints a message
1250 IF INSTR(FLNM$,".") =0 AND ((RIGHT$(FLNM$,4)<>".TXT" OR RIGHT$(FLNM$,4)<>".txt")) THEN FLNM$=FLNM$+".TXT" ' Supply a default
extension of .TXT
1260 OPEN FLNM$ FOR INPUT AS #1 ' If the file doesn't exist (or the filename is illegal), the error handling routine prints an err
or message
1270 ON ERROR GOTO 0
1280 '
1290 FOR I=1 TO BUFFERSIZE
1300 LNKT=I-1
1310 IF EOF(1) THEN I=BUFFERSIZE:GOTO 1340 ' If at the end of the file, quit
1320 LINE INPUT #1, T$(I)
1330 IF INSTR(T$(I),"$$$$") THEN LNKT=I:I=BUFFERSIZE ' If there is an "end" marker also quit
1340 NEXT
1350 CLOSE
1360 IF CGA THEN RETURN 400 ELSE RETURN 250
1370 '
1380 ' ----- Tally frequencies and make bar graph -----
1390 IF CGA THEN SCREEN ,,GRAPH,CURSCR:CURSCR=GRAPH
1400 CLS:IF LNKT=0 THEN LOCATE 4,8:ERRMSG$= "No text to tally":IF CGA THEN SCREEN ,,GRAPH,GRAPH:GOSUB 2750:RETURN ELSE GOSUB 2750:
RETURN
1410 ' ----- Set up initial values----
1420 SCKT=1:MAXSCALE=MAX%SCALE(SCKT):ZTOTALW=0:LONGW=0 ' SCKT is the scale count, keeps track of which of the 7 scales  is being u
sed. MAXSCALE is the maximum number that can be handled using a given scale. ZTOTALW are the total words
1430 ZSUM=0:ZSUMSQR=0:MODE=101:ZTEMP=0:MEDIAN=0 ' Various variables used to compute statistical measures.  The ones starting with
 Z are single precision
1440 GOSUB 2320 ' Subroutine to set up screen
1450 ERASE FREQ:DIM FREQ(101) ' Clear the word frequency array
1460 IF CGA THEN SCREEN ,,GRAPH,GRAPH
1470 ' ----- Do all the lines ----
1480 FOR I=1 TO LNKT
1490 WORK$=LEFT$(T$(I),253)+" " ' Keep the string in legal bounds
1500 IF INSTR(WORK$,"$$$$") THEN I=LNKT:WORK$=LEFT$(WORK$,INSTR(WORK$,"$$$$")-1)+" " ' Check for end of text
1510 IF LEN(WORK$)=1 THEN 1770 ' Skip if just an empty line with a space
1520 ' ---- Change punctuation to spaces ----
1530 FOR CHAR = 1 TO 7 ' Check for 7 different punctuation marks ,.?';;-
1540 FOUND=1 ' Force entry into while loop
1550 WHILE FOUND
1560 FOUND=INSTR(WORK$,CHECK$(CHAR)) ' FOUND will be zero if there isn't a match, gives the location if there is
1570 IF FOUND THEN MID$(WORK$,FOUND,1)=" " ' If there is something to change, change it to a space
1580 WEND
1590 NEXT
1600 STARTW=1 ' The start of a word
1610 ' ---- Do the string breakdown and tabulation ----
1620 ENDW=INSTR(STARTW,WORK$," ") ' The end of a word is at the space after STARTW
1630 IF ENDW=0 THEN 1770 ' No end, means we are done with the line
1640 WORDLEN=ENDW-STARTW:IF WORDLEN=0 THEN 1760 ' Skip, nothing to print
1650 FREQ(WORDLEN)=FREQ(WORDLEN)+1:ZTOTALW=ZTOTALW+1 ' Classify the word lengths and count all the words
1660 LOCATE STATBASE+1,69:PRINT USING "##,###";ZTOTALW; ' Print it out
1670 IF WORDLEN>20 THEN LONGW=LONGW+1:LOCATE STATBASE +2,71:PRINT USING "#,###";LONGW;:GOTO 1760 ' Count the long words, but our g
raph only goes up to 20
1680 IF FREQ(WORDLEN)<=MAXSCALE THEN 1750 ' Scale still fits
1690 '
```

More

Listing continued.

```
1700 SCKT=SCKT+1: MAX%SCALE=MAX%SCALE(SCKT) ' Adjust scale
1710 IF CGA THEN GRAPH=5-GRAPH :SCREEN ,,GRAPH,CURSCR
1720 GOSUB 2320:GOSUB 2470 ' Update & redraw the screen
1730 IF CGA THEN SCREEN ,,GRAPH,GRAPH:CURSCR=GRAPH
1740 '
1750 YPOS=FREQ(WORDLEN)\SCALE(SCKT):IF YPOS THEN LOCATE GRAPHBASE-YPOS,16+(WORDLEN%3):PRINT CHR$(219); ' Add to the bar if necessa
ry
1760 START%=END%+1:GOTO 1620 ' Get ready to count the next word
1770 NEXT ' Next line
1780 '
1790 IF ZTOTALW<2 THEN LOCATE STATBASE+5,55:PRINT "No text to tally":GOTO 2010 ' To avoid division by zero
1800 LOCATE STATBASE+5,55:COLOR 31,0:PRINT "Calculating Statistics":COLOR 7,0 ' It takes a while, so lets you know that nothing we
nt wrong
1810 ' ---- Statistics calculations ----
1820 FOR WORDLEN=1 TO 100
1830 ZSUM = ZSUM + WORDLEN*FREQ(WORDLEN) ' Sum of products
1840 ZSUMSQR = ZSUMSQR + WORDLEN*WORDLEN*FREQ(WORDLEN) ' Sum of products squared
1850 IF FREQ(MODE)<FREQ(WORDLEN) THEN MODE=WORDLEN ' Mode is the most common frequency
1860 IF MEDIAN =0 THEN ZTEMP=ZTEMP + FREQ(WORDLEN):IF ZTEMP=>ZTOTALW/2 THEN MEDIAN = WORDLEN ' Median has half the words below, ha
lf above
1870 NEXT
1880 '
1890 ZMEAN=ZSUM/ZTOTALW ' The "average" length, correctly called arithmetic mean
1900 ZVARIANCE=(ZSUMSQR - (ZSUM*ZMEAN))/(ZTOTALW-1):ZSDEV=SQR(ZVARIANCE) ' A measure of how spread out the word length is
1910 '
1920 LOCATE STATBASE+5,55:PRINT SPACE$(24);
1930 IF COLR THEN COLOR 14,0,6
1940 LOCATE STATBASE+6,55:PRINT USING "       Mode =     ##";MODE;
1950 LOCATE STATBASE+7,55:PRINT USING "     Median =     ##";MEDIAN;
1960 LOCATE STATBASE+8,55:PRINT USING "Arith. Mean =    ##.##";ZMEAN;
1970 LOCATE STATBASE+9,55:PRINT USING "Stand. Dev. =    ##.##";ZSDEV;
1980 LOCATE STATBASE+10,55:PRINT USING "       Skew =   ###.##"; 3*(ZMEAN-MEDIAN)/ZSDEV; ' How crooked, non-symmetrical the curv
e is
1990 IF FLNM$<>"" THEN LOCATE STATBASE+11,53:PRINT "File Name = ";FLNM$;
2000 IF COLR THEN COLOR 3
2010 LOCATE 25,5: PRINT "Hit any key to continue";
2020 SOUND 1200,5 ' To wake you up
2030 K$=INPUT$(1):IF CGA THEN RETURN 400 ELSE RETURN 250
2040 '
2050 ' ---- Display Text Routine ----
2060 IF CGA THEN SCREEN ,,TYPE,CURSCR
2070 CLS:IF LNKT=0 THEN ERRMS6$="No text to show":LOCATE 4,8:IF CGA THEN SCREEN ,,TYPE,TYPE: GOSUB 2750:RETURN ELSE GOSUB 2750:RET
URN
2080 IF COLR THEN COLOR 9,0,3 ELSE COLOR 7,0
2090 LOCATE 1,8:PRINT "<Enter> returns you to main menu.":PRINT
2100 PRINT TAB(8) "Show text on <S>creen or <P>rinter and screen";
2110 COLOR 7,0
2120 IF CGA THEN SCREEN ,,TYPE,TYPE:CURSCR=TYPE
2130 LOCATE 3,53:PRINT SPACE$(27):LOCATE 3,53:SHOW$=INPUT$(1)
2140 IF ASC(SHOW$)=13 THEN RETURN
2150 IF INSTR("SsPp",SHOW$)=0 THEN BEEP:GOTO 2130 ' Illegal entry
2160 CLS
2170 FOR I=1 TO LNKT
2180 PRINT USING "###  ";I; ' Print line number
2190 IF LEN(T$(I))<74 THEN PRINT T$(I):GOTO 2220 ELSE PRINT LEFT$(T$(I),74) ' If a line is longer than what's left of the 80 scree
n width characters, IBM BASIC prints it on the next line, so we split the text into lines that fit
2200 WORK$=MID$(T$(I),75)
2210 IF LEN(WORK$)<74 THEN PRINT TAB(6) WORK$ ELSE PRINT TAB(6) LEFT$(WORK$,74):WORK$=MID$(WORK$,75):GOTO 2210 ' Keep on splitting
 until done
2220 IF SHOW$<>"p" AND SHOW$<>"P" THEN 2260 ELSE LPRINT USING "###  ";I; ' The same for the printer, keep it within 80 characters.
  Skip the printer routine if not P or p
2230 IF LEN(T$(I))<74 THEN LPRINT T$(I):GOTO 2260 ELSE LPRINT LEFT$(T$(I),74)
2240 WORK$=MID$(T$(I),75)
2250 IF LEN(WORK$)<74 THEN LPRINT TAB(6) WORK$ ELSE LPRINT TAB(6) LEFT$(WORK$,74):WORK$=MID$(WORK$,75):GOTO 2250
2260 NEXT
2270 IF COLR THEN COLOR 11,0,0
2280 PRINT :PRINT TAB(6) "All done.  Hit any key to continue":TA$=INPUT$(1)
2290 RETURN
2300 '
2310 ' ---- Graph screen set up  routine ----
2320 CLS:COLOR 7,0:FRM$=STRING$(22,205)
2330 LOCATE STATBASE,53:PRINT CHR$(201) FRM$ CHR$(187)
2340 LOCATE STATBASE+1,55:PRINT USING    "Total Words = ##,###";ZTOTALW;
2350 LOCATE STATBASE +2,55:PRINT USING " Words > 20 =  #,###";LONGW;
2360 LOCATE STATBASE+3,53:PRINT CHR$(200) FRM$ CHR$(188)
2370 LOCATE GRAPHBASE+1,5:PRINT "Word Size ->  1  2  3  4  5  6  7  8  9  0  1  2  3  4  5  6  7  8  9  0" ' Word lengths
2380 FOR KT=1 TO 9
2390 LOCATE GRAPHBASE-14+KT,5:PRINT MID$("FREQUENCY",KT,1); ' Vertical printing
2400 NEXT
2410 FOR KT=0 TO MAX-1
2420 LOCATE (GRAPHBASE-MAX)+KT,9:PRINT USING "####";(MAX-KT)*SCALE(SCKT);:PRINT      CHR$(186);' How many words numbers, verticall
y stacked, plus a framing bar
2430 NEXT
2440 RETURN
2450 '
2460 ' ---- Updating the bars after scale change ----
2470 FOR BAR=1 TO 20
2480 IF FREQ(BAR) THEN BARTOP=FREQ(BAR)\SCALE(SCKT) ELSE GOTO 2530
2490 IF BARTOP = 0 THEN 2530
2500 FOR M= 1 TO BARTOP
2510 LOCATE GRAPHBASE-M,16+(BAR*3):PRINT CHR$(219);
2520 NEXT
2530 NEXT
2540 RETURN
2550 '
2560 ' ---- Print heading ----
2570 FRM$=STRING$(45,196):COLOR 7,0
```


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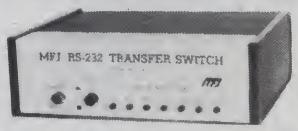

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By Robert W. Baker

Uncovering The C-64's CIA

New Adapter Chip Features I/O Port, Timers and More

Commodore-64 CIA

The Commodore-64 has two MOS 6526 Complex Interface Adapter (CIA) chips for interfacing with the outside world. This chip is unique to the Commodore-64 since former PET, CBM and VIC-20 systems used the older Peripheral Interface Adapter (PIA) or Versatile Interface Adapter (VIA.

The newer CIA chip offers several features that haven't been mentioned much. Unfortunately, sections of the original *Commodore-64 Programmer's Reference Guide* that gave more insight into the wonders of the new chip were omitted before the book was finalized.

Each CIA chip has two eight-bit parallel ports, two interval timers, a time-of-day clock and a buffered synchronous serial I/O port. One of the two parallel ports is available on the User Port for interfacing with a multitude of external devices.

You can use the interval timers to delay programs by an exact amount of time, to count external signals or to measure the frequency of an external signal. The time-of-day clock is a 24-hour clock with an am/pm indicator and a 24-hour alarm.

The CIA chip has 16 internal registers that control its functions. The CIA #1 chip occupies memory locations 56320–56335 ($DC00–$DC0F) and the CIA #2 chip occupies memory locations 56576–56591 ($DD00–DD0F]. For the interval timers, time-of-day clock and synchronous serial ports, the programming of both CIA chips is the same except for the change in memory locations used.

There are certain restrictions in regard to when you can use the internal timers, but the time-of-day clock can be used at any time. The operating system uses the interval timers, but the time-of-day clocks are not used at all!

The normal C-64 "clock" is generated via software from a 60 Hz interrupt, and it's maintained in RAM locations 160–162. This is the so-called "jiffy clock" that's used to generate the values accessed by TI and TI$ in Basic programs. Since the jiffy clock relies on system interrupts, it's not always accurate during cassette I/O, while the CIA time-of-day-clock is always accurate.

The Parallel Ports

Registers 0 and 1 of the CIA chip are eight-bit parallel data ports. These ports can be programmed bit-by-bit for either input or output as defined by the corresponding bits in data direction registers 2 and 3.

When a bit in register 2 is set to 1, the corresponding bit in register 0 (Data Port A) is defined as an output bit. When the same bit is cleared to 0, the data port is defined as an input bit. The same is true for Data Direction register 2 and register 1 (Data Port B).

On the CIA #1 chip, the parallel ports are used for reading the keyboard, joysticks, paddle fire buttons and the light-pen trigger. On the CIA #2 chip, the parallel ports are used for several I/O functions, including the serial IEEE bus, RS-232 interface and the User Port.

Using the Interval Timers

Registers 4 and 5 at locations 56324–56325 ($DC04–$DC05) form a 16-bit interval timer (Timer A) in low-byte/high-byte format for CIA #1. Registers 6 and 7 at locations 56326–56327 ($DC06–$DC07) likewise form the 16-bit Timer B. Each of the interval timers in the 6526 CIA chip consists of a 16-bit read only countdown timer and a 16-bit write only timer latch.

You can set a starting value for an interval timer by using the Poke statement in Basic to write a new value to the CIA timer latch, low-byte first and high-byte last. If the timer is stopped, the new latch value is loaded into its counter. If the timer is running, the new starting value is latched, but normally is not loaded into the counter.

You can read the present timer value using the Peek statement, whether the timer is running or not. The interval timers can be used independently or they can be linked for use as a single 32-bit timer.

You should be aware that the operating system uses each of the interval timers at one time or another, so that use of the timers in your programs is restricted to the following conditions:

- Timer A in CIA #1 is used to generate the 60 Hz system interrupt signal that is used for updating the "jiffy clock" and controlling the keyboard scan, among other functions. This timer can't be used in any program without serious side effects.
- Timer B in CIA #1 is used only during cassette and serial IEEE bus operations. You can use this timer when you do not have tape or disk files open and you are not using the printer. Both timers in CIA #2 are used for the RS-232 port to "clock" data bits in and out. If you do not have an RS-232 device in operation, both of these timers can be used by your program.

Interval Timer Output

You can use the output of the interval timers to generate time delays in programs or to externally create variable width pulses, pulse trains or variable frequency waveforms.

By using the CNT input signal on the CIA chip, you can count external pulses or measure frequency, pulse width and delay times of external signals. For CIA #1, the CNT signal is found on pin 4 of the User Port connector, while the CNT signal for CIA #2 is on pin 6.

Each timer can be programmed for several operating modes or functions

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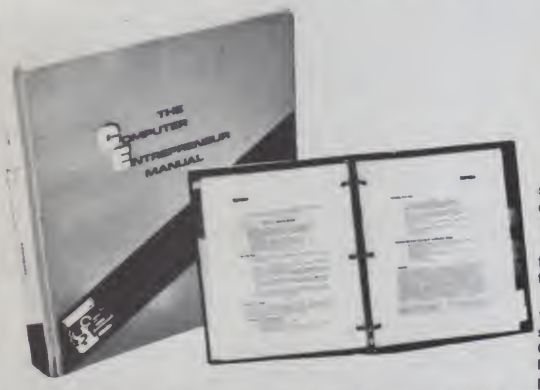

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through an associated control register. The control register for Timer A is register 14 at location 56334 ($DC0E); register 15 at location 56335 ($DC0F) controls Timer B for CIA #1. The various interval timer functions and their associated control register bits are defined in the 6526 CIA description in the *Commodore-64 Programmer's Reference Guide* (Appendix M).

For CIA #2 only, the output of Timer A can appear on User Port pin K (Data Port B, bit 6) and the output of Timer B can appear on User Port pin L (Data Port B, bit 7). This function overrides the Data Direction Register bits for CIA Data Port B and automatically forces these lines to outputs when the appropriate control bits are set.

For Timer A only, bit 5 of its control register determines what signals the timer will count. When this bit is set to 1, the timer will count low- to-high-voltage transitions of the CNT signal on User Port pin 4 for CIA #1 or pin 6 for CIA #2. This timer mode can be used to count the occurrences of some external event.

When control register bit 5 is cleared to 0, the timer will count the system clock pulses. Since the system clock frequency is 1.022727 MHz, the interval for a single timer count in this mode is 977.778 nanoseconds. The maximum interval that a single 16-bit timer can measure, therefore, is 64.078 milliseconds. The timer latch value required for any given time delay can be calculated by dividing the delay time by the system clock time period.

For Timer B only, bits 6-5 of its control register select one of four sources for count signals. Clearing both bits to 00 will cause Timer B to count system clock pulses. Setting bits 6-5 to 01, respectively, causes Timer B to count low-to-high voltage (positive) transitions of the CNT signal on the external User Port pin 4 for CIA #1 or pin 6 for CIA #2.

When bits 6-5 are set to 10, Timer B will count Timer A underflow pulses. This effectively links the two timers together to form a single 32-bit timer, which can measure an interval of about 70 minutes. When these bits are set to 11, Timer B counts Timer A underflow pulses while the CNT signal is in a high-voltage state. This allows controlling of the counting of Timer A underflow pulses from an external source connected to the CNT pin.

Using the Time-of-Day Clock

The time-of-day clock (TOD) in the CIA chip consists of a 24-hour clock and alarm with am/pm indicator and one-tenth-of-a-second resolution. The TOD clock and alarm occupy registers 8–11 at locations 56328–56331 ($DC08–$DC0B) in CIA #1. Programming for the TOD clock in CIA #2 is identical except for the address changes. Any read of the TOD clock registers will give you the present time. A control register bit determines whether writing to TOD clock registers will set the time of day or the alarm.

Time is kept in the TOD clock/alarm registers in "binary-coded-decimal" format (sometimes called, obviously, BCD). This is a numeric data format, used by the microprocessor to perform some arithmetic operations, where two decimal digits are "packed" into one memory location.

The BCD format is similar to hexadecimal in that four bits are used to form a single digit. However, BCD uses the base-10 number system, whereas hexadecimal is base-16. Thus, the highest number represented in a single four-bit digit is a 9, and the highest number represented in an eight-bit memory location is 99.

When reading the TOD clock registers, you must convert the data read from BCD to binary format if it is to be printed or displayed. Likewise, before setting the TOD clock or alarm, you first must convert the data to BCD format.

Here's an example in Basic on how to read the TOD minutes register and convert the data into a floating-point variable:

```
10 A=PEEK(56330) AND 15
        :REM Units digit
20 B=PEEK(56330) AND 240
        :REM 10's digit
30 C=B*10+A
        :REM Convert to Floating point
```

Here's another Basic example that illustrates how data might be converted from variable MIN to BCD format to update the same register:

```
100 A=INT(MIN/10)
        :REM Get 10's digit
110 B=A*16
        :REM Put in bits 7–4
120 C=MIN–A*10
        :REM Get units digit
130 POKE 56330,B OR C
        :REM Update TOD minutes reg
```

The time-of-day hours is in CIA register 11 and its value may range from 0 to 11. The am/pm indicator is bit 7 of this register and a bit value of 1 means pm. Minutes are in CIA register 10 and seconds are in register 9. Values for these registers may range from 00 to 59. Tenths of seconds appear in bits 3 to 0 of CIA register 8.

You must follow a specific sequence in reading the time of day and in setting the time or alarm. When reading the time of day, the hours register must be read first and the one-tenth-second register must be read last.

Since a carry from one TOD register to another can occur at any time while reading the time, a latching function is built into the TOD clock. When the hours register is read, the data in all TOD registers is "frozen" until the one-tenth-second register is read. The clock keeps on running during this time, but the register outputs are held constant.

When the one-tenth-second register is read, the register latching is disabled and the clock "picks up" the current time from its internal counter. When only one register is to be read, there is no carry problem and the register may be read at any time. However, any read of hours must be followed by a read of one-tenth of a second to disable the latching.

Bit 7 of CIA register 15 is used to determine whether a write to the TOD registers will set the clock or the alarm. If this bit is a 1, the alarm time will be set. If the bit is 0, the time of day will be set. When setting the alarm time, you do not need to follow any particular sequence to write to these registers.

When setting the time of day, you must write to the hours register first and the one-tenth-second register last. The TOD clock stops when hours are written and automatically restarts when the one-tenth-second register is written.

A 50 or 60 Hz signal from a source external to the CIA chip is required for operation of the TOD clock. Bit 7 of CIA register 14 is used to select whether a 50 or 60 Hz signal is supplied. A bit value of 1 selects a 50 Hz signal and a value of 0 selects a 60 Hz signal. This bit is normally a 0 for both CIA chips in the C-64, since a 60 Hz signal is connected. As I said earlier, the time-of-day clocks are not used by the current operating system, so you're free to use them at any time.

The Synchronous Serial Port

The serial port in the 6526 CIA chip is a buffered, eight-bit shift register system that permits synchronous communication. When data is sent asynchronously, as with the RS-232 interface, the bits of a character are transmitted at a specific rate; characters, however, are sent at varying time intervals. When sending and receiving data synchronously, characters are sent as a continuous stream of bits for the entire length of a message.

Bit 6 of CIA control register 14 selects whether the serial port will send or receive data. When set to 1 for sending, transmission starts following a write to CIA register 12, the serial data register. The character is automatically transferred into an interval shift register, and bits are shifted out serially, most significant bit first. The data appears on User Port connector pin 5 for CIA #1 and pin 7 for CIA #2.

In the output mode, Timer A is used to determine the rate at which bits are shifted out and Timer A must be running in continuous mode. The data is shifted at half of the underflow rate of Timer A, with the timer output appearing as a pulse on the CNT pin.

In theory, the maximum possible rate is one-fourth of the system clock rate, or approximately 250,000 bits per second. In practice, however, the rate will be determined by several factors, including line-loading and the rate at which the receiver can respond to incoming data.

For receiving data, bits are shifted into the shift register as clock pulses are applied to the corresponding CNT pin. After eight CNT pulses, the shift register is dumped into the serial data port (CIA register 12), and an interrupt flag is set. The communications program must read the serial data register before the next eight bits are received in the shift register; otherwise, characters will be lost.

The bidirectional capability of the serial port and the CNT "bit-clock" signal allows many 6526 CIA devices to be connected to a common serial bus, where one device acts as the master, providing both data and clocking signal while all others act as slaves. This fact is used in the implementation of a local networking system soon to be available for C-64 computers.

CIA Interrupt Control

There are five sources of interrupts on the 6526 CIA chip: Timer A underflow, Timer B underflow, Time-of-Day alarm, serial port full/empty and a special Flag interrupt. The Flag input of CIA #2 is used to detect an incoming start-bit on the RS-232 interface and for message "collision" detection on the local network interface. The Flag signal is wired to User Port pin B for CIA #2. On CIA #1, the Flag signal is used for cassette and serial IEEE operations.

CIA register 13 is the interrupt control register and consists of a write only interrupt mask register and a read only interrupt flag register. Any interrupt condition will set its corresponding bit in the flag register. Further, any interrupt condition that is enabled in the mask register also will set bit 7 of the flag register and generate a system interrupt. The flag bits will be set whether the interrupt is enabled or not.

The individual interrupt flag/mask bits are as follows:

Bit 0	Timer A
Bit 1	Timer B
Bit 2	Time-of-Day Alarm
Bit 3	Serial port full/empty
Bit 4	Flag signal
Bits 5–6	Unused
Bit 7	One or more interrupts present and enabled

The interrupt mask register provides for convenient, selective enabling and disabling of interrupts by setting bits corresponding to the flag register bits. An interrupt is enabled when its bit is set to 1 and disabled when its bit is cleared to 0. If no interrupts are enabled, bit 7 of the flag register will not be set when an interrupt flag is set.

Commodore-64 Cartridges

The new C-64 game cartridges from Commodore are super, with exceptional graphics and sound. The only disappointment is that most of the games provide only one level of play. (Considering what's available for simpler game machines, you'd think the game cartridges for the C-64 would provide similar variations and selection of play levels.)

LeMans

My favorite is LeMans, a nifty little racing game that gets to be rather addicting. You race against computer-controlled cars and try to pass as many cars as you can. The more cars you pass, the more points you get and the longer you can race.

A standard game paddle is used for steering, and the fire button controls your speed. Steering is a little tricky at first, but quite easy once you get used to it.

The course is tough—icy roads, divided highways, winding curves and night driving with only your headlights to guide you. Passing the other cars isn't always easy; they try to block you whenever they can.

Every time your car is hit by another car, the pits appear and you must move off the road for repairs. A few seconds later, your car returns to normal and you can continue racing. Pit stops are costly, both in time and score.

Normal scoring is based on your speed and cars passed. You need to score 20,000 points every minute to continue racing.

Kickman

My son's favorite is Commodore's version of Bally/Midway's Kickman. In this game, you control a unicyclist and try to rack up points by breaking and catching balloons, ghosts and Pac-Men on your head. The various balloons drop in accordance with their point values, with lower-scoring balloons falling much slower than higher-scoring balloons.

If you miss a balloon, you can kick it up and try to catch it later, but then things really get tricky. Whenever you miss and something hits the ground, you lose one of your five unicyclists. If you score 40,000 points, you can get an extra unicycle.

Either a joystick or a keyboard can be used for this one-player game.

Seawolf

Seawolf is another Bally/Midway arcade game that's been converted for the C-64. You try to sink and destroy the enemy ships by using the paddle controller to move your submarine and to fire torpedoes.

The targets are freighters, cruisers and PT boats that travel at different speeds. The quicker boats are worth more points, but you're armed with only four torpedoes at a time.

You get to choose the length of your playing time, from one to nine minutes. The game is better when played by two, but it can be played by one as well.

Clowns

Clowns is another Bally/Midway conversion that's a lot like the Circus Atari game on the Atari VCS.

Three rows of balloons float across the top of the screen. You control a seesaw that bounces clowns in the air as they try to grab at the balloons. Points are scored as balloons are popped by the bouncing clowns. If you miss a clown when he comes down, you lose that clown and you have to start again.

Clowns is designed for one or two players and uses game paddles for control.

Music Machine

The Music Machine cartridge allows you to play your C-64 like a musical instrument. Your computer keyboard is transformed into a synthesizer keyboard, complete with percussive accompaniment. A number of parameters can be mixed and matched, allowing you many combinations of sound type, special effects and keyboard playing styles.

The keyboard is laid out in three sections: keyboard, control and percussion.

The keyboard section is like a piano or organ, covering 1½ octaves. The control section consists of three keys on each side of the keyboard. The left keys select the keyboard mode, effect and waveform. The right keys control the starting octave of the keyboard and the number of voices that are played. The percussion section uses the four function keys to control the rhythm accompaniment.

As you play, you can easily switch between any of six octaves. Normally, only a single voice is used, so only one note is heard at any one time. Two and three voice modes allow you to hear two or three notes at a time. This makes the sound more orchestrated.

The various keyboard modes include decay, sustain and hold. In decay mode, each note fades when played; when changed to sustain, each note remains on for as long as you press the key. If the hold mode is selected, you 'll see that the note remains on continuously.

There are several special keyboard effects, but you have to hear them to note the difference. In addition, seven different rhythms, with selectable tempo, are built in. The rhythm accompaniment uses one voice, so only one or two voice modes can be selected for keyboard play when the percussion is on.

If you want to play along with songs on a radio or on another sound source, a pitch control adjustment is included to allow for differences between the tuning of the cartridge and the music being listened to. Now you can "tune" your cartridge just like an instrument.

Misc

I finally got to try Commodore's Gortek

and the Microchips for the Commodore-64. It's an excellent learning experience for ten- to 13-year-olds who want to learn to program. The packaging is superb, too, with plenty of graphics.

As good as this package is, however, there are a few things in the book that seem to have slipped through unnoticed. Plus, the typesetting of the program listings makes them hard to read at times.

A Couple of Bugs

It appears that the original programs were written for the VIC-20 and then revised for the C-64, but not quite everything was updated before being distributed. There are several mentions about 20-column screens, and warnings about statements running onto two lines, when it just doesn't happen on the C-64.

The book doesn't clearly explain the loading procedure for the C-64. When the instruction programs try to load the game programs from tape, the load command is displayed on screen, with the cursor positioned on the same line. You have to know to press the return key and then type RUN once the program is loaded. There's no mention in the book about having to hit another key after a program is found in order to get it loaded from tape.

What happened to the automatic loading of programs that can be done a number of ways?

Before I forget, the answers for pages 26 and 27 are swapped in the answer section at the back of the book. Also, there are no starting instructions for PV. When you see the brick wall with the Place Value heading, simply hit any key to get the program to continue.

Even with the oversights, Gortek and the Microchips is still a respectable package. You get a number of excellent games that also teach simple programming ideas and help acquaint you with the keyboard controls.

Mach-20 and Sprintyper

Two more programs (on tape) for the VIC-20 were released from Mantronics Software Design (360 Pierce Ave, N. Mankato, MN 56001). The first is the Mach-20 machine language monitor. It takes only 257 bytes of RAM, so it will run in any size VIC-20. It supports the basic set of monitor commands similar to those on the PET and CBM monitors.

You can display and modify registers or memory, start execution or return to Basic. You also can load and save programs on disk or tape. When saving programs, you can even make them nonrelocatable so they'll always load in the same location.

It's not quite as extensive as HESmon and others, but then Mach-20 lists for only $7.95.

If you need help learning to type, you might like Mantronics' Sprintyper program for the VIC-20. The program displays a sentence that you're to type as quickly as possible while being timed and checked for errors. A low tone indicates a mistake and you must go back and correct it before going on. When you finish the sentence correctly, the program will display your typing time, number of errors and record time.

Sentences include questions, commands, exclamations and statements. On each trial, a sentence structure is randomly selected and then one word is selected from a list of appropriate words for each variable. Through this process, 105 words, eight digits and four punctuation marks are used to generate 356,625 unique sentences. You just can't outguess the sentences, even though they seem to sound the same after a while.

Avalon Calling

The Avalon Hill Game Co. (4517 Harford Road, Baltimore, MD 21214) notes that a number of its games written for the PET will run on the Commodore-64 with no alterations necessary. These games are: B-1 Nuclear Bomber, North Atlantic Convoy Raider, Nukewar, Planet Miners, Draw Poker and Andromeda Conquest. Although these games were not written for the C-64, they do offer the challenge and strategy inherent in Avalon Hill software. (It's suggested thay you change the color of the display by typing CONTROL-2 before running the programs.

Spider City and Repton

Sirius Software, Inc. (10364 Rockingham Dr., Sacramento, CA 95827), announced two new game programs for Commodore machines.

Spider City is a rescue mission through dark and dangerous tunnels. It was released in June and is available on cartridge for the VIC-20.

Repton involves a fictional place that has been invaded by Quarrior forces. You must prevent them from completing their base. Repton, released in June, is available on disk for the C-64.

I just received the latest catalog from Skyles Electric Works (231E South Whisman Rd., Mountain View, CA 94041). If you have any interest in Commodore systems, I suggest that you get a copy. It's great reference material, besides being a source of a number of accessories and programs for all models of Commodore systems.

Besides, Skyles offers a ten-day return policy, no questions asked, on any item listed in its catalogs. If you contact the Skyles people, be sure to let them know what system you have, since they now have separate catalogs for the PET/CBM and VIC/C-64 series. □

The Gortek and the Microchips games package features good graphics and sound, is easy to play and fun to use.

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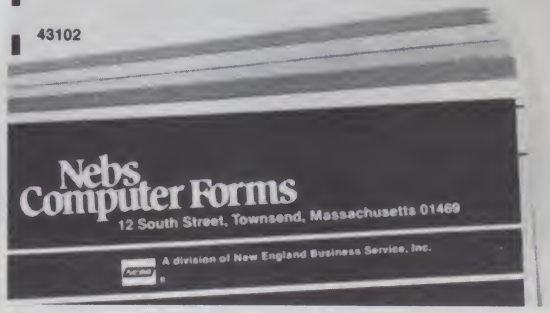


OVERVIEW

By Frank J. Derfler, Jr.

Of Mouses And Micros

Real Mice Don't Eat Cheese

This month, we'll examine an integrated software package combining word processor, spreadsheet, file-handling and graphics capabilities. But first, we'll take a look at one of the hottest new items in the microcomputer marketplace: the electronic mouse.

Mouses and Men

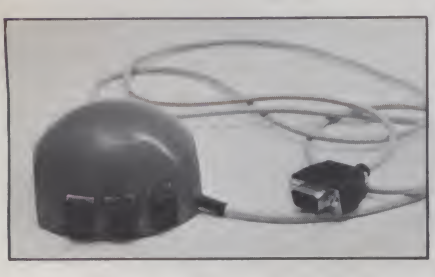
What shall we call them—mice or mouses? The term "mice" carries real rodent implications, while the term "mouses" is much more benign. I vote for "mouses."

These devices, complete with tails, paws and even (in some cases) eyes, are finding homes in and around a growing number of microcomputers.

Let's look at a couple of mouses and then evaluate whether they're really helpful or just electronic hula-hoops.

The mice device I am speaking of is, of course, an electromechanical input system that allows you to have full control of cursor movement and to make a few programmed inputs by pressing the mouse's paws (keys). You can move the mouse over your desktop and use it to command your computer to perform tasks defined by the program you are running. The mouse allows fast and accurate positioning of the cursor and selection of menu items.

The credit for developing the mouse goes to Doug Englebardt. He designed it in 1961 while he was an employee of SRI in Menlo Park, CA.



Logitech's mouse sells for $285.

Looking Back: Track Balls

Despite their recent popularity, though, mouse-like input devices are not new. In fact, they are older than the computer industry itself.

Manual cursor-positioning devices were a common part of radar display consoles by the end of World War II. The military UPA-1 radar scopes used joysticks, and other scopes used a device called a "track ball" to move a cursor (then often called a "hook") around the screen.

The track ball is like a croquet ball embedded in the desk with the top of the ball exposed. You roll the ball in one direction or another to move the cursor on the screen. It's an accurate method of positioning, and you can move the ball with your fingertips instead of using whole arm movements like you have to with a mouse.

Some modern radar systems use track balls instead of mouse-like or joystick devices. I don't know why the computer industry has concentrated on these two devices to the almost total exclusion of the track ball, which has proven to be fast and effective when the chips are really down. (I do note that Atari is now offering a track ball.) However, mouses are what the micro manufacturers are offering us, so mouses are what we'll look at.

A Tale of Two Mouses

I wanted to understand what a mouse can do, so I found two that I think provide the most interesting features. These two devices operate in very different ways and make a good comparison. Both are designed for the IBM PC. (By the way, if it seems to you that everything new that comes out is for the IBM PC first, you're right!)

The first mouse I tried is distributed by a company called Logitech in Palo Alto, CA. This mouse was designed in Switzerland and, according to the literature, has been fielded and proven there during the past three years.

The Logitech mouse has a hemispheric shape, so you have to cup your hand over it, although your hand and arm can rest comfortably in this position. The mouse has three buttons that can be used to send any three keyboard commands to the computer.

The most attractive feature of the Logitech mouse is the way it connects to the IBM PC. Most mouses connect through the RS-232C serial port. This means that the mouse uses one of the two serial ports available to the PC.

The loss of this port can be unimportant or it can be a real problem, but the Logitech mouse avoids the potential for a problem completely. Logitech provides an interface box that attaches in series with the keyboard cable on the IBM PC. All mouse inputs appear to be keyboard inputs to the computer. This method of attachment, which leaves the serial ports free, is simple. This serial keyboard arrangement, however, has one drawback and one advantage.

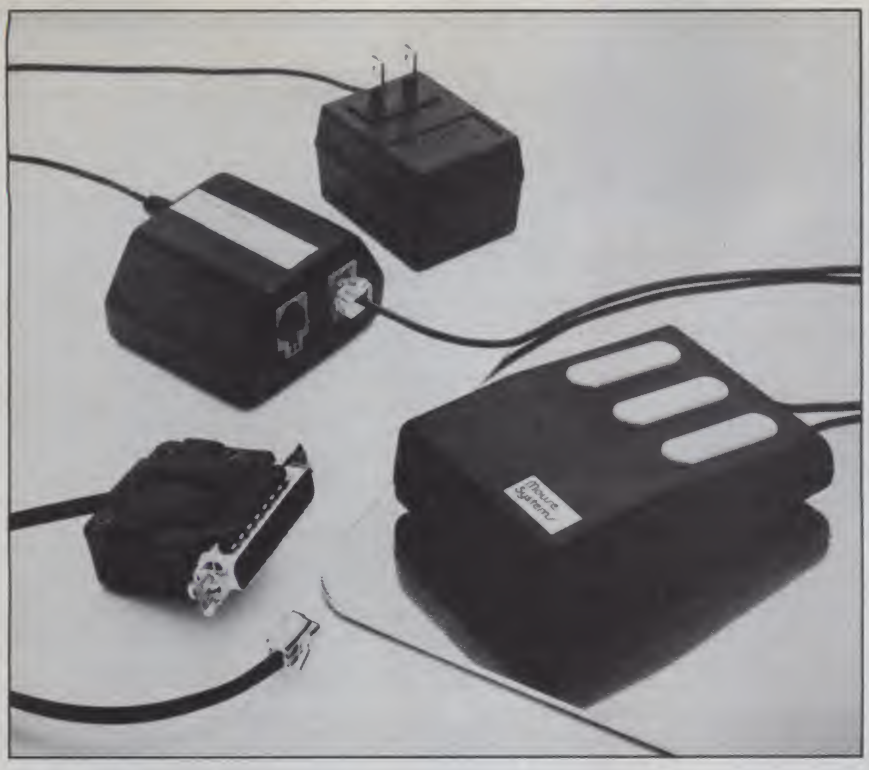
The IBM PC accepts keyboard inputs through a fairly small buffer. If your software doesn't add any buffering, the keyboard buffer can overflow and cause the computer to scold you with its beeping. It's possible to overload the keyboard buffer with this mouse if you move it too quickly. In practice, this isn't a big problem; you learn to move at a speed that matches the input rate of the buffer.

There *is* a secondary benefit. If you are using the IBM graphics card and move too quickly, you can easily overshoot your target. The IBM graphics card has a display delay caused by memory management. With the mouse, the pace of input matches the pace of display and you have a balanced system.

No Special Software Needed

The big advantage of the mouse's appearing to be a keyboard input is that you don't need any special software for inte-

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.



PC Mouse's triple-key feature lets you input three times the number of commands.

gration into your PC. There is a short program allowing you to define the mouse's input keys to send any desired character to the PC, but otherwise the mouse is ready to run with any program that recognizes the cursor movement keys.

(Mouses using the RS-232C port to attach to the computer require special patches to be made to the operating system or application software. These patches must be made on a custom basis for each piece of software you want to run. Developing this software interface can be a real problem.)

The Logitech mouse uses a smooth roller ball to slide over any kind of desk or workstation surface. The internal electronics include photo-optic sensors to detect movement of the ball and shift registers to cut down on the size of the connecting cable.

I like the Logitech mouse a lot. It operates smoothly and does its job well. Because it looks like the keyboard to the computer, it doesn't need any special software to hook into the operating system or application program.

Logitech sells this little critter for $285. If you're interested, you can reach Logitech at 165 University Ave., Palo Alto, CA 94301 (phone 415-326-3885).

More Mouse Facts

Another interesting mouse you should consider is the PC Mouse from Mouse Systems (2336 H. Walsh Ave., Santa Clara, CA 95051).

This mouse is unique for several reasons. First, it contains no moving parts; it has no wheels or rollers to wear out or lose calibration. The mouse finds its way around by monitoring the lines on a special board placed on the work surface.

PC Mouse's technology is similar to that of an optical bar code reader. As the lines go by, the mouse scans them with its LED eyes and reports its position to the computer. The software in the computer causes the cursor to move with the mouse.

The second major feature of the PC Mouse is its ability to input three times the number of commands than other mouses. The program integration software recognizes up to three rapid punches from each key. You can make nine inputs with the mouse by using multiple keystrokes.

The PC Mouse requires an RS-232C input and integrating software. I used it with both WordStar and the 1-2-3 information management program from Lotus Software. The patches needed to integrate the optical mouse with these programs came on a disk with the mouse. If, however, you want to use it with other programs, you may face a significant customization challenge. The mouse can be addressed easily in Basic programs.

The PC Mouse retails for $332 with its integrating software. Phone Mouse Systems at 408-988-0211 for more information.

Mouse Trapped

When I started this review, I was really pro-mouse. I was sure that the use of a program like 1-2-3 could be improved by using a mouse for menu-selection and cursor-positioning. I was sure that system inputs would be easier for both experienced and novice users. Now, after using two well-integrated mouses, I'm not so sure.

The greatest advantage gained by using a mouse with the IBM PC is the elimination of the need to switch between the number keys and arrow keys on the keypad. IBM makes dual use of these keys; you have to switch between them to move the cursor and enter numbers using the keypad. The mouse eliminates this problem, but it raises others.

Moving the mouse and positioning the cursor requires practice and attention. I found that it caused further division of my attention between the screen, keyboard and mouse. Also, you have to memorize the key positions on the mouse, and this memorization becomes even more complex if you try to take advantage of the triple-key features of the PC Mouse. Quite frankly, I was surprised at how little I enjoyed using a mouse, even with a cursor-intensive program like 1-2-3.

I introduced the mouse to some novice computer users and their response was about the same. At first, they thought it would be a nice way to communicate with the computer. But after they became involved with building their own spreadsheets, the mouse became a distraction and they ignored it in favor of the keyboard.

It became obvious to me that a mouse may be worth its price only when used with specially designed software. If you're using software with symbols or specially designed menus, then a mouse may improve the usability of the software. But if you're simply adding a mouse to an existing program, I suggest you make sure it will give you enough value to offset its price.

T/Maker III

In the September 1982 issue of *Microcomputing*, I had an article describing the T/Maker II program from the T/Maker Company of Falls Church, VA. In that review, I explained that T/Maker stood for "table maker," and I praised the program for its ability to combine spreadsheets with text.

T/Maker II was one of the first integrated software packages. It integrated an excellent word processor with a spreadsheet and added some data-manipulation capability. It provided the ability to embed a table in a page of text, repeat the table later with slightly different figures and leave it to the computer to figure the correct totals and values.

T/Maker II also had data-handling capabilities, such as the ability to sort lists by key items and to alphabetize. This program was particularly valuable to anyone doing report-writing or analysis that mixed tables and text.

T/Maker II has been superseded by a revised program called (logically enough) T/Maker III. T/Maker III is more and better. It has more data-handling commands, the added ability to create horizontal bar charts (on any screen or printer) and good printed documentation. T/Maker III is available for eight-bit computers under CP/M and for 16-bit machines under CP/M-86 and MS DOS (PC DOS). It is also available for Unix systems.

The T/Maker III word processor is unique in that it gives you the ability to tailor the control code commands to take advantage of your keyboard's special keys or to match the control characters used by your other software packages. This means that operators who use one word processor that is commanded by control codes (such as WordStar) can use exactly the same commands for word processing under T/Maker III.

The T/Maker spreadsheet is different from any other I have seen. It is not a VisiCalc clone; instead, it allows you to arrange commands around the border of the spreadsheet. You can see the commands and understand the logic of the table at a glance. The external commands are erased for printing.

The spreadsheet will automatically compute growth rates, provide projections and perform transcendental functions. You can perform calculations between two tables and pass the computed values in one table to a second table. The program will update the data in both tables as it is changed.

The new T/Maker III documentation is eye-catching and easy to read. The manual is bound and tabbed and the style of writing is clear and direct. The operational information in the manual is clear and complete.

I think many people will wish for more customization and installation information; few real installation situations are covered in the manual. I'd like to see pages of tables describing the installation parameters for the many microcomputers this software can be used with.

Pros and Con

If you told me I could have only one program for my microcomputer, I would choose T/Maker III. It's versatile and powerful and it suits the kinds of things I do.

I've used the program to demonstrate the power of the personal computer to people who know nothing about computers. Because of the number of operating systems it is available for, I could run the same program on every microcomputer I own.

In the real world, though, we don't use just one program. T/Maker III lacks the help commands that are an important part of modern software packages. In many ways, learning its command language is like learning a simple version of Basic. You have to memorize and know the command words. This certainly is the weakest part of the software. If you use it every day, you'll love it. If you use it occasionally, you'll probably struggle to remember the commands.

Peter Roizen, T/Maker III's author, has tried to overcome this problem in two ways. He provides a separate quick-reference booklet that lists all of the commands. It's not just a cardboard folded sheet, either; it's a compact booklet, printed in large type, that provides an abbreviated guide to each command. Roizen also provides an extensive set of demonstration files that can be used for training.

The booklet and the demonstration files help to make T/Maker III easier to use, but I still wish the commands could be selected from an optional prompting menu.

If you're interested in putting together meaty and meaningful reports, or if you're looking for a good integrated word processing, data processing and graphics system for CP/M, T/Maker III will serve you well. It's a good buy at $275.

For more information, contact the T/Maker Company, 1742 Willow Road #206, Palo Alto, CA 94304 (phone 415-326-6103).□

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LETTERS TO THE EDITOR

Something's Wrong

I have noticed an apparent error in a program in the May issue of *Microcomputing*. The program is on p. 56 and is entitled "A Sinclair Quick Fix." Line 170 of Listing 1 on p. 56 reads:

170 LET D = +Z*16**(1 – Y)

As it stands, the line won't be accepted, and it seems that something ought to precede the "+Z"—but I'm not quite up to figuring out what.

My compliments for a fine magazine and excellent articles for our Marvelous Midget from Timex.

Donald J. Flaster, M.D.
Morris Plains, NJ

Reply:

There is an error in my article "A Sinclair Quick Fix" in the May issue (p. 56).

Line 170 in Listing 1 should be:

170 LET D = D + Z*16**(1 – Y)

I have also received a lot of questions about the INPUT D$ commands in Listings 3 and 4. In both cases, these commands are used only to temporarily stop the programs to give you time to start the cassette tape recorder.

It doesn't matter what is entered, the only thing that does matter is that the program is "stuck" at the input command until the enter key is pressed. When the enter key is pressed, the program will continue on normally.

Alan Sehmer
Corrales, NM

How Do You Interface . . . ?

Do you or any of your readers have information on how to interface a Model 33 Teletype to an Atari 400, Texas Instruments 99/4A or Timex-Sinclair 1000?

I would like to know if an interface can be constructed to allow the use of a standard stereo cassette recorder with the Atari 400; if Atari joysticks can be used with the TI 99/4A, and if so, how would they be connected?

Also, does anyone have any information on how to interface a TRS-80 Color Computer, TI 99/4A, TS-1000 and Atari (any combination)?

Timothy J. McIlwee
RR 2, Box 462A
Dundee, IL 60118

HX-20 Users Respond

Thank you for publishing my letter in the May edition of *Microcomputing* (Letters to the Editor, p. 24). It was through reader response from that letter that I was able to successfully establish the HX-20 User's Group.

We had received only a minimal response from our requests in UK magazines; however, that was made up for by the response to the letter you published. I am pleased to say that HX-20 users read *Microcomputing*.

The HX-20 User's Group has published its first newsletter and the group was present at the recent Computer Fair at Earls Court in London.

If anyone would like to receive more information on the HX-20 User's Group, please contact me.

Terence L. Ronson
HX-20 User's Group
25 Sawyers Lawn
Drayton Bridge Road
Ealing, London W13

What's the Problem?

In the October issue of *Microcomputing*, Gregory Glau's article "Invest in Your Apple," p. 116, provides a program called "Appreciation Program for the Apple II Plus." I typed in the program and have been trying for the past few months to get it to work, but I've had no luck. I keep getting an "Illegal Quanity Error 15250."

Is there a solution to this problem?

P.H. Creasor
F.P.O., San Francisco, CA

Reply:

The problem with your program seems to be in line 15220. You read the printout as:

15220 IF Z9<B THEN 15400

The line actually reads:

15220 IF Z9<8 THEN 15400

It's difficult to tell that it should be an 8, rather than a B, after the greater-than sign.

I have also received a letter from another reader, pointing out that one line of the program creates a problem when you try to print a hard copy. Line 570 of the program appears as:

570 PRINT " "

This line contains control characters that didn't show up in the listing. Line 570 should read:

570 PRINT "CTRL I 80 N"

This lets the printer print at 80 columns, rather than the 40 on the Apple screen. Of course, those control characters don't show up in the program listing. What happens is that the printout is squashed into 40 spaces, rather than the 80 it needs.

Gregory Glau
Prescott, AZ

Pay Attention!

The Letters to the Editor section of the June 1983 *Microcomputing* gives two illustrations of the need for greater attention to programming style.

While "gotoless" programming is not practical for Basic, the adoption of goto statements tends to inflate programs. For example, C.G. Harvey eliminates a bug in a program by D.C. Shoemaker (June *Microcomputing*, p. 28) by changing the lines

210 IF A 5 THEN A A 1
220 IF A 6 THEN A A 2

by adding a goto:

210 IF A 5 THEN A A 1: GOTO 230

A more elegant solution is provided by:

210 IF A 6 THEN A A 2
220 IF A 5 THEN A A 1

Michael P. Kaufmann asks for help in resolving a fatal error in a centering subroutine (June *Microcomputing*, p. 29) and a suggestion to do a manual search for the offending entry is offered. A much better solution would be to expand the subroutine with a set of lines that gives the user a chance to recover before the error is encountered, such as:

7000 IF LEN(A$) 41 THEN 7010
7001 PRINT: PRINT "LINE TOO LONG—REENTER"
7002 INPUT A$: GOTO 7000
7005 . . .

Line 7005 now becomes the former line 7000. I don't know the original program, so a more complex routine may be needed to restore the screen by wiping out the error messages, or placing them at the bottom of the screen. The point is that subroutines can, and should, be made proof against fatal errors.

George Herman
Bowling Green, OH

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```
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  VAR
  SUM : REAL;
BEGIN
SUM : = A + B + C;
WRITE ('AVERAGE IS', SUM/3.0);
END;
```

To call up the procedure from anywhere in the program, just write;

```
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PRINT_AVERAGE (−1, 0, 37.4);  etc.
```

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TK! Solver: Is It Magic?

Software Arts has billed its TK! Solver package as a revolutionary problem solver, but does the software live up to this advanced billing? In this article, TK! Solver's power and performance are weighed against its drawbacks.

By Timothy Daniel

When I heard about TK!Solver, my first reaction was, "It sounds like a great program, but what do the T and K stand for, and why the exclamation mark?"

A few days later I found the answer: TK stands for "tool kit," and the exclamation key is used to initiate a calculation.

As much sense as this explanation makes, I still prefer my own. The TK, to me, is the same as the proofreader's symbol for "to come," denoting something in the future.

A Revolution for Number Crunchers

Software Arts modestly calls TK!Solver a "Revolution in problem solving...a totally new concept." Aimed at the professional market, TK! is meant for engineers, scientists, planners—anyone who currently uses a calculator or, perhaps, a dedicated computer program to crunch numbers.

Let's look at a typical TK!Solver problem: A mechanical engineer must determine the cross section and material to be used for a beam (structural member) so that cost is minimized and the limit on elastic bending is not exceeded.

Following the traditional route, you would search through reference manuals for the correct equations and constants, then work through a raft of calculations. If you want to repeat the process for a slightly different set of values, it's back to pushing buttons. As any engineer will tell you, there are better ways to spend an afternoon than punching in similar calculations time and time again.

If your life's work is centered around beam problems, chances are you would use computer modeling. It wouldn't be terribly difficult to write such a program in Basic, but that approach has several drawbacks.

First, you have to know something about programming, or enlist the aid of a skilled programmer. Second, your program locks you into a rather specific type of problem. What would you do if you wanted to solve problems where the beam carries a distributed load? Here's where TK!Solver enters the picture. It allows you to enter the pertinent equations (or rely on canned formulas from a TK!Solver-Pack), input the known variables, press ! and out will come the answers. It sounds simple, and it is.

More Than a Spreadsheet

At this point, you might protest that TK!Solver is little more than another spreadsheet program. In fact, you might even conclude that TK!Solver is just a souped up version of VisiCalc. After all, TK! comes from Software Arts, the same people who wrote VisiCalc.

Yes, TK!Solver does have similarities to VisiCalc, but not enough to be put in its immediate family. Cousins perhaps, but certainly not brother and sister.

The most noticeable difference between TK! and an electronic spreadsheet is the separation that exists between the equations and the numbers that are used to work them. Instead of using templates a la VisiCalc, TK!Solver has "sheets," 11 in all, forming the structure shown in Fig. 1.

If you were using TK! to solve the beam problem, the rule sheet would contain the equations or "rules" that relate a beam's parameters to the amount of elastic bending. As you enter the equations, the variables that compose them are automatically superimposed on the variable sheet. Next, you would move your cursor to the variable sheet, input values, and then type !. After a short pause, TK! supplies answers for the unknowns in the output column of the variable sheet.

There Are Some Limits

Of course there are some limits to this magic. TK!Solver doesn't repeal the laws of algebra; your model must be complete. If you wanted to solve the gas mileage equation mpg = m/g, you would have to provide both the miles and gallons values. But what makes TK! so special is the ease with which you can tinker with the model.

If you're working on the beam problem, and decide to vary the radius rather than the cross section, it's a simple matter to enter yet another equation, this one relating the radius to the area. As long as the variable names are kept consistent, the intermediate values will be passed right on through. You don't even need to enter the equations in logical order!

Making Duck Soup

While the rule and variable sheet form the backbone of a TK!Solver model, it is the other nine sheets that give the program its flexibility. The unit sheet makes duck soup of the problem of unit conversions.

Looking at the beam problem again, it would be a simple matter to enter the length and radius parameters in metric units and still use English units for the bending coefficients. The unit sheet contains the conversions between the two systems.

TK!Solver's subsheets are like the story behind the story. You reach a subsheet by "diving" to it. To display a variable subsheet (there's one for ev-

Address correspondence to Timothy Daniel, 7 Peabody Drive, Oxford, OH 45056.

ery variable), locate the cursor over the variable name and simply type >.

Part of the variable subsheet duplicates information found on the variable sheet. However, there are also fields to define a first guess for iterative solutions (more on this later), a list of values associated with the variable and a calculation units field. The latter works in concert with the units sheet and allows you to define one set of units for display purposes and another for making calculations. Returning to the master sheet—reversing the dive—takes only one keystroke.

TK!'s list feature allows you to create a database of numbers, eliminating the need to enter a new set of values every time you change the problem. The list sheet acts as an index for the database, defining the unit and the number of entries for each variable. By diving from the list sheet to a list subsheet, you can examine and alter

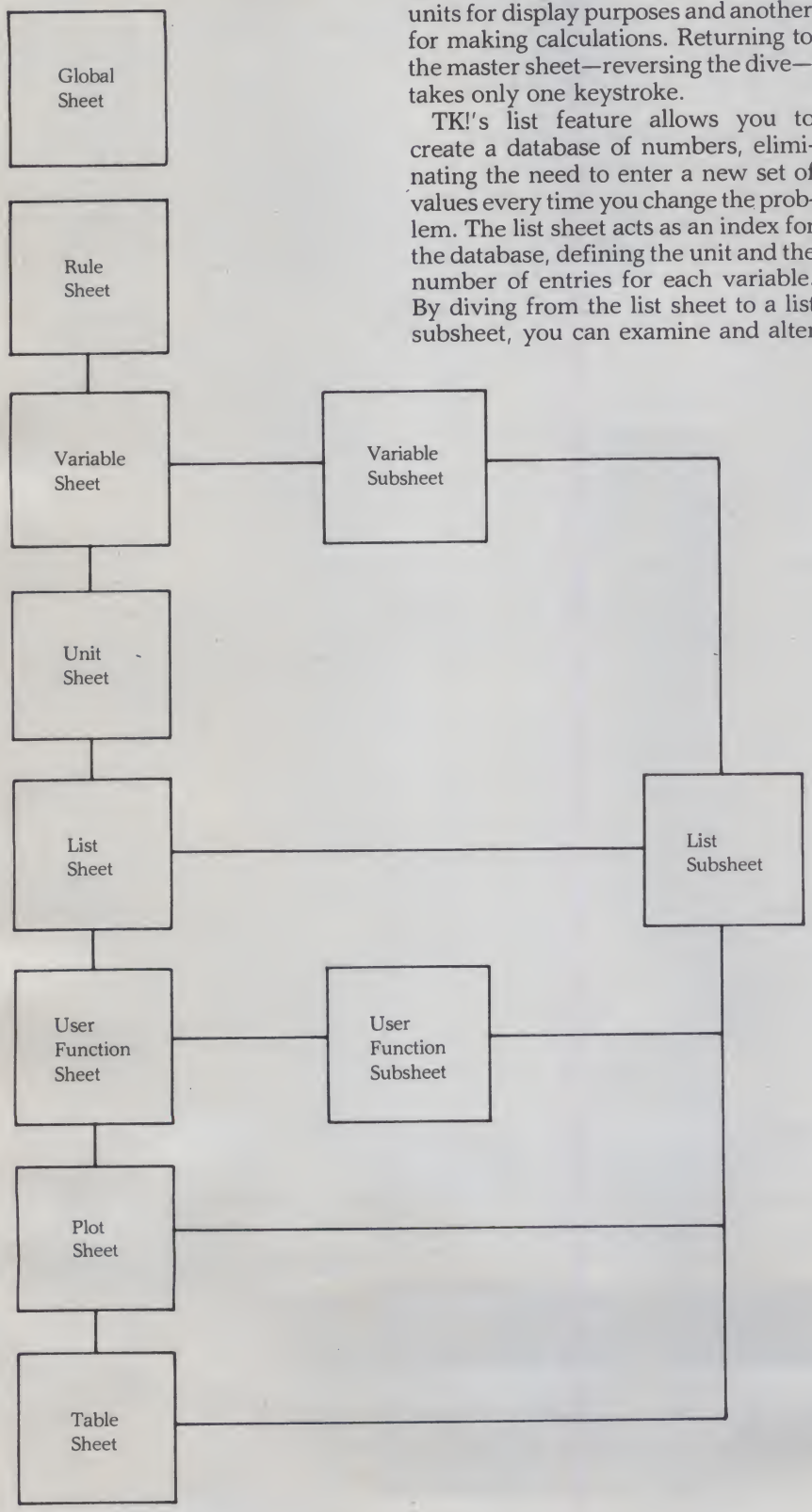

Fig. 1. Eleven sheets are used to input, display and manipulate TK!Solver data and models. Horizontal windowing allows two sheets to be displayed at once. Movement within sheets is similar to VisiCalc.

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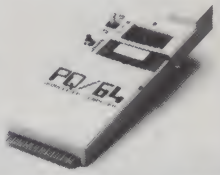

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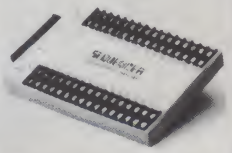

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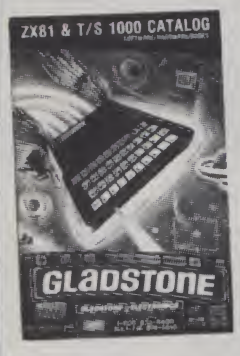

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the values assigned to a variable. It's a bit like a one-dimensional array in Basic. Each element carries a number and a corresponding value.

The TK!Solver tutorial nicely illustrates how lists can be used when solving a home mortgage problem. You would create lists of data for each input variable, assigning element 1 to bank 1, element 2 to bank 2, and so forth.

Then you can direct TK!Solver to solve the model for all the banks, a single set of elements or a range of banks. The answers you generate can be stored in yet another list, and then be used in a tabular or plot display.

More Crunching Power

Further crunching power is available through TK!'s user function sheet and user function subsheets. These sheets allow you to supplement TK!'s built-in functions with your own. User-defined functions may have tabular, step or linear relationships.

The table function proves especially handy if you have a relationship that just doesn't fit into equation form. User functions can be labeled by number or symbol. The latter allows you to use familiar names rather than cryptic numeric designators.

Rounding out the TK! structure are the plot, table and global sheets. The plot sheet creates a two-dimensional display with a list of values on the x axis and another for the y axis. Scaling is linear with the limits determined by the list's maximum and minimum values.

The table sheet supports vertical and horizontal tabular outputs. Field widths are independent and can range from three to 128 characters. Serving as TK!Solver's housekeeper, the global sheet handles mundane chores like printer control and the limits for the iterative calculator.

The list, plot and table sheets certainly add to TK!Solver's flexibility, but the core of the program's problem-solving ability lies in its functions. There are 35 built-in mathematical functions, ranging from absolute value to arc hyperbolic cosine.

Functions specific to TK!Solver include specialized ones like net present value for financial modeling and generalized operators like DOT, which takes the dot product of two lists. A complete listing of built-in functions is given in Table 1.

While TK!Solver's functions outstrip what is offered by any spreadsheet program, they do not directly address high-level problems. For example, the TK! POLY function allows you to calculate the value of a polynomial for a specified variable and series of coefficients, but there is no equivalent function to solve a polynomial equation. To work this sort of problem, you might try an indirect approach using TK!'s iterative capability.

If, for example, you wanted to solve the equation $3X^3+2.5X^2+2X+1.5=0$, you would supply a guess for the value of X and direct TK!Solver to work through the equation, automatically improving the guess through successive approximations. The iterations halt when the solution meets the tolerance requirement or if the number of tries equals a preset limit.

The success with which TK!Solver is able to find a solution depends on the quality of your guess. Unsuccessful results take the form of a slow convergence, divergence or oscillation. While the iteration feature is a powerful one, it must be used with care. In some cases, there may be

ABS	absolute value
ACOS	arc cosine
ACOSH	arc hyperbolic cosine
APPLY	user function application
ASIN	arc sine
ASINH	arc hyperbolic sine
ATAN	arc tangent
ATANH	arc hyperbolic tangent
ATAN2	arc tangent for x1/x2
COS	cosine
COSH	hyperbolic cosine
COUNT	number elements in a series
DOT	dot product of two series
E	natural log base
ELEMENT	used with lists
EXP	exponentiation
GIVEN	checks to see if variables have input values
INT	truncation to integer
LN	natural log
LOG	base 10 log
MAX	select maximum value in a list
MIN	select minimum value in a list
MOD	modulus
NPV	net present value
POLY	sums polynomial for given coefficients
SGN	checks for >, =, < 0 conditions
SIN	sine
SINH	hyperbolic sine
SQRT	square root
STEP	checks for x1 >, =, < x2
SUM	sums a series of values
TAN	tangent
TANH	hyperbolic tangent

Table 1. TK!Solver's built-in functions.

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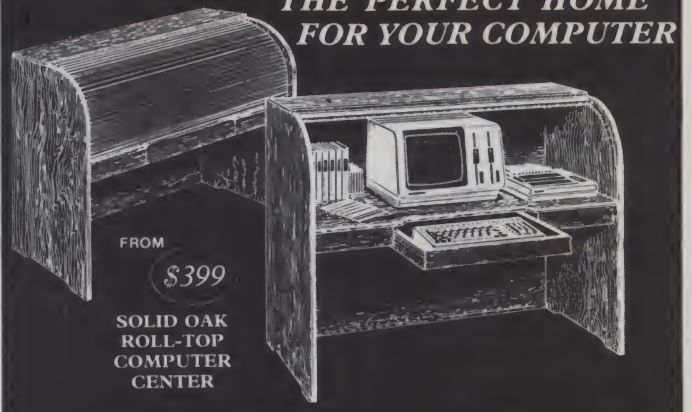

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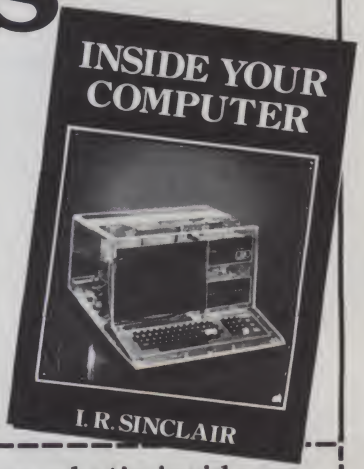

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```
Name        Elements   Unit       Comment
----        --------   ----       -------
sales       10         $
cgs         10         $          cost of goods sold

LIST: sales
Element  Value
-------  -----
1        1200000
2        1200500
3        1201000
4        1201500
5        1202000
6        1202458
7        1203000
8        1203500
9        1204000
10       1204500
```

Table 2. List Sheet and List Subsheet. The list sheet works in a manner similar to an array, allowing you to assign a series of values to a variable. The subsheet shows the makeup for one variable's list.

more than one correct solution, necessitating that you experiment with guess values.

How Well Does It Perform?

The preceding discussion has focused on the things TK!Solver can do. Now let's look at how well TK!Solver does them.

Since it is billed as everyman's problem solver, it must be both powerful and easy to use. In the power department, TK!Solver certainly outstrips VisiCalc and its clones. It excels at solving straightforward algebraic models, especially those where there is a large library of data to be processed. As problems become more sophisticated, you will find it necessary to break them down into smaller chunks and synthesize a model using TK!'s wide assortment of sheets and the iterative calculator.

With 11 sheets, 34 functions and more than 60 commands, TK!Solver represents a learning challenge as formidable as any word processing or database program. Some, but not the majority, of the commands are identical to those used in VisiCalc. If you have a firm grasp of windowing, you'll catch on to the TK!Solver basics quickly. However, moving from the basics to an advanced skill level will require a substantial investment in time. If it took you 20 hours to become an "expert" with VisiCalc, you should count on spending 40 to 50 hours mastering TK!Solver.

Affiliated with the learning process are TK!Solver's support mechanisms: on-screen help messages, well-written documentation and tutorials. The on-screen help is thorough, but inefficient. Time-consuming disk accesses are required, making it almost as fast to flip through the manual. A further detraction is the inability to use the help screens on a 40-column display. This seems to be a direct contradiction of Software Arts' claim of compatibility with 40-column monitors.

A Word on Documentation

The TK!Solver documentation is more voluminous than its VisiCalc counterpart, but it is similar in form. A

```
(15i) Input: 1202458                                                    58 /!

==================== VARIABLE SHEET ============================================
St Input      Name     Output     Unit       Comment
-- -----      ----     ------     ----       -------
              c_asset  425700     $          total current assets
              f_asset  778500     $          net fixed assets
   1204200    t_asset             $          total assets
    234000    c_liab              $          total current liabilities
    358500    lt_debt             $          total long-term debt
    611700    equity              $          total equity
              capital  970200     $          total capitalization
   1202458    sales               $/yr       sales
==================== RULE SHEET ================================================
S Rule
- ----
       "From the financial statement
  c_asset=cash+acc_r+inv+oth_c_asset
  t_asset=c_asset+f_asset
  ebit=sales+oth_inc-cgs-opr-depr
  capital=lt_debt+equity
  net_inc=ebit-int-inc_tax

       "Profitability analysis -- du Pont system
```

Table 3. TK!Solver allows you to window its display. The variables and rule sheets from the TK! Financial Pack Ratio Analysis module are shown here.

single binder contains two manuals plus a brief introductory brochure.

The instruction manual serves as a written tutorial, giving step-by-step instructions on how to get the program running and how to utilize its features.

The spoon-feeding approach of TK!'s instructions causes several problems. First, you spend a lot of time typing in models and data that you're probably not interested in. Second, the examples tend to be simplistic and are sometimes better suited for VisiCalc.

The final flaw is the presence of several erroneous instructions. I prefer to get to the heart of the matter and went directly to my own problem, relying on the reference manual to get me over the rough spots. The reference gives a complete, albeit terse, description of TK!Solver's features.

Few microcomputer programs rival TK!Solver's sophistication and complexity. A lot of effort has been expended to insure that the program's algorithms will accurately solve even the most complex models. But along with the sophistication comes a tendency to be slow and memory intensive. The IBM Personal Computer version of TK!Solver requires a minimum of 96K of RAM. Even with 128K or more of RAM, frequent disk accesses are required.

Simple problems take longer to solve on TK! than on VisiCalc; with complex models, solution, loading and storage times can stretch into minutes. An expensive and only partial cure is to use a bank of RAM as a disk emulator. Although it seems cumbersome at times, TK!Solver beats doing problems by hand. The paradox comes from TK!'s frequent dead spells, but if you were using a calculator you'd still be busy pushing buttons.

Despite the availability of plot and table sheets, I found TK!Solver to be unwieldy for generating professional-looking output. The temptation is to use TK! to crunch the numbers and then rely on a word processor for the final draft.

Among my other observations, I noted that the documentation contains no less than six copies of Software Arts' licensing agreement. Also, conspicuous by its absence is any sort of phone number for support. I guess that chore is left to dealers. Finally, Software Arts' approach of using a mainframe system to apply TK! to various micros may help in cornering the market, but it also seems to eliminate the use of many system-specific features. For example, TK! doesn't apply any of the IBM PC's function keys.

As of this writing, TK!Solver is only available for the IBM PC. An Apple version should be out by mid-1983, and Software Arts has indicated that a new IBM version that addresses several of the problems noted here will be released in the near future. These are both good signs. While it can be said that TK! lives up to the fundamental promise of problem solving without programming, its long-term success will depend on two factors: 1) refinements made by Software Arts and 2) acceptance and support by professionals in widely varying fields. When those two things occur, I'll revise my definition from "to come" to "tool kit." Software Arts, 27 Mica Lane, Wellesley, MA 02139. $299.)■

Software Solutions From the Leader of the Packs

An important part of Software Arts' support of TK!Solver is the TK!SolverPacks' instant models. All you have to do is add values for the input variables and type !. At the time this review was written, packs were available for mechanical engineering and financial management. Future releases will include architecture, construction and electrical engineering.

The models in each pack cover a wide spectrum of problems, a fraction of which may be useful to the buyer. For example, the Financial Pack's 13 models include one that solves compound interest problems, a model designed to aid a firm contemplating a bond refund and a model for Black-Sholes Option pricing, which will be of interest to serious investors.

Besides their ability to provide instant problem solving, the TK!SolverPacks can be used as a jumping-off point for creating your own models. The comprehensive documentation makes the packs a great way to learn about developing your own models, and are a natural "next step" after you complete the TK!Solver tutorial.■

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Quick Draw!

Get the jump on the rest of the competition with this program that lets you design creative, intricate artwork on the IBM PC.

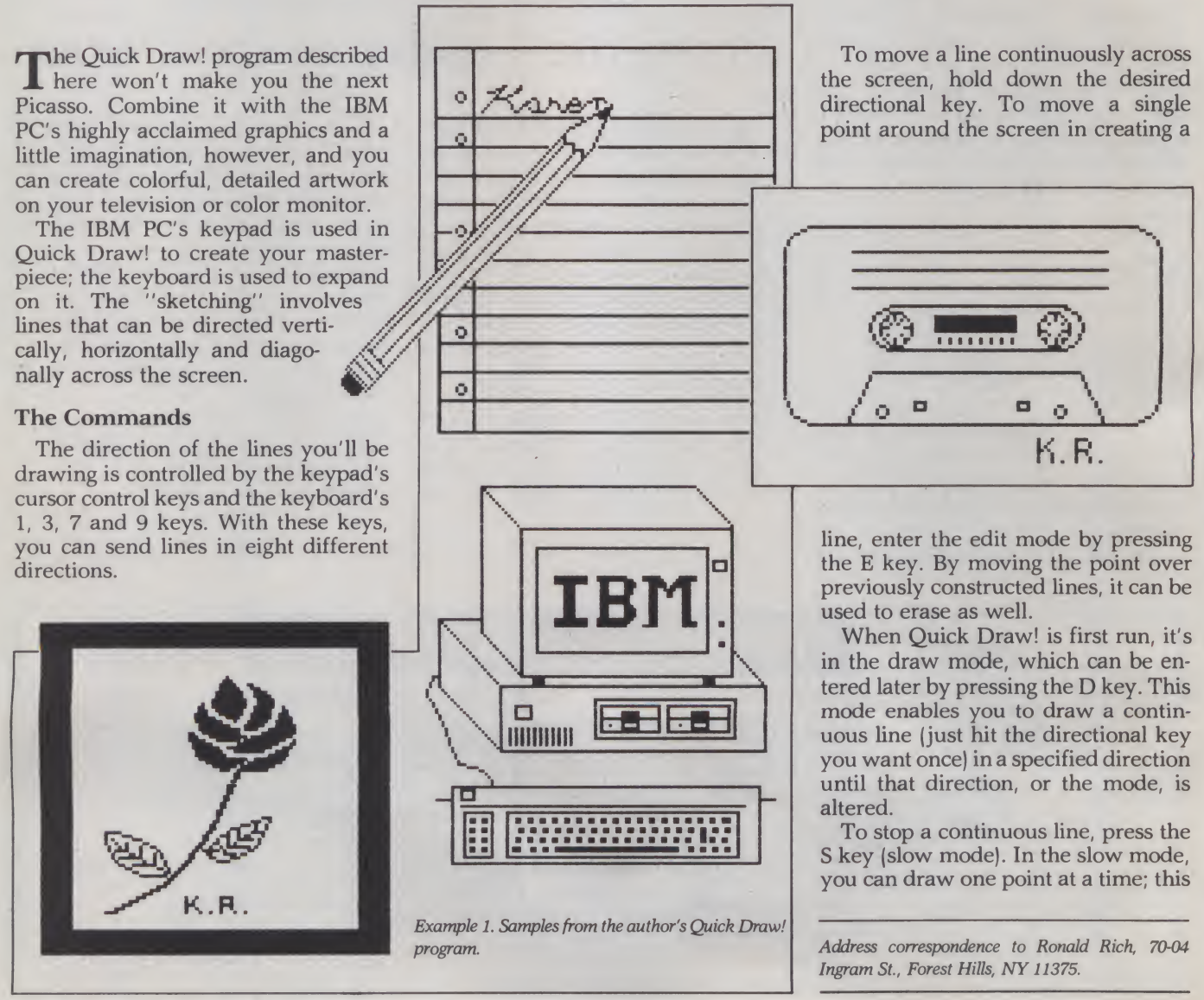
By Ronald Rich

The Quick Draw! program described here won't make you the next Picasso. Combine it with the IBM PC's highly acclaimed graphics and a little imagination, however, and you can create colorful, detailed artwork on your television or color monitor.

The IBM PC's keypad is used in Quick Draw! to create your masterpiece; the keyboard is used to expand on it. The "sketching" involves lines that can be directed vertically, horizontally and diagonally across the screen.

The Commands

The direction of the lines you'll be drawing is controlled by the keypad's cursor control keys and the keyboard's 1, 3, 7 and 9 keys. With these keys, you can send lines in eight different directions.



Example 1. Samples from the author's Quick Draw! program.

To move a line continuously across the screen, hold down the desired directional key. To move a single point around the screen in creating a line, enter the edit mode by pressing the E key. By moving the point over previously constructed lines, it can be used to erase as well.

When Quick Draw! is first run, it's in the draw mode, which can be entered later by pressing the D key. This mode enables you to draw a continuous line (just hit the directional key you want once) in a specified direction until that direction, or the mode, is altered.

To stop a continuous line, press the S key (slow mode). In the slow mode, you can draw one point at a time; this

Address correspondence to Ronald Rich, 70-04 Ingram St., Forest Hills, NY 11375.

Listing 1. Quick Draw! program for the IBM PC.

```
20 '   Quick Draw! - for the IBM Personal Computer
40 '   Author - Ronald Rich
60 DEF SEG = 0:POKE &H410,(PEEK(&H410) AND &HCF) OR &H10:SCREEN  0:WIDTH  40:
LOCATE  ,,1,6,7
80 REM Number Lock Conversion
100 DEF SEG = &H40:POKE &H17,PEEK(&H17) OR 32
120 REM End of Conversion
140 KEY OFF:CLS:CLEAR ,62000!,50000!:DIM PT%(9):SCREEN 1:COLOR 17,1
160 PRINT TAB(15)"Quick Draw!"
180 PRINT :PRINT "The Numerical Keypad will direct the    line in 8 possible
directions using the cursor control keys and 1,3,7,9 for     diagonal movemen
t."
200 PRINT :PRINT "Keyboard:"
220 PRINT "  D - program will enter into draw mode"
240 PRINT "  E - program will enter into edit mode"
260 PRINT "  S - program will enter into slow mode"
280 LOCATE 12,1:PRINT "  C - clears screen of all lines"
300 PRINT :PRINT" color of the line can be altered:
320 PRINT " B - blue background with white                foreground"
340 PRINT " W - black background with white               foreground"
360 PRINT " R - red background with yellow                foreground"
380 PRINT " P - magenta background with cyan              foreground"
400 LOCATE 25,8:PRINT "  Created by Ronald Rich    ";:FOR Z=1 TO 1000:A$=INKEY
$:IF A$="" THEN NEXT ELSE GOTO 460
420 LOCATE 25,8:PRINT "press any key to continue";:FOR Z=1 TO 500:A$=INKEY$:I
F A$="" THEN NEXT ELSE GOTO 460
440 GOTO 400
460 SCREEN 1:CLS:KEY OFF:COLOR 16,1
480 X=160:Y=100:A=1:B=0
500 PSET (X,Y)
520 GOSUB 560
540 GOTO 520
560 REM $Keyboard$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
580 A$=INKEY$
600 IF A$="6" THEN 620 ELSE 680
620 B=0:IF A=1 THEN 1460
640 IF A=2 THEN PSET (X,Y):GOSUB 2840
660 IF A=3 THEN GOSUB 3340
680 IF A$="2" THEN 700 ELSE 760
700 B=0:IF A=1 THEN 1620
720 IF A=2 THEN PSET (X,Y):GOSUB 2900
740 IF A=3 THEN GOSUB 3380
760 IF A$="4" THEN 780 ELSE 840
780 B=0:IF A=1 THEN 1780
800 IF A=2 THEN PSET (X,Y):GOSUB 2960
820 IF A=3 THEN GOSUB 3420
840 IF A$="8" THEN 860 ELSE 920
860 B=0:IF A=1 THEN 1940
880 IF A=2 THEN PSET (X,Y):GOSUB 3020
900 IF A=3 THEN GOSUB 3460
920 IF A$="9" THEN 940 ELSE 1000
940 B=0:IF A=1 THEN 2100
960 IF A=2 THEN PSET (X,Y):GOSUB 3080
980 IF A=3 THEN GOSUB 3500
1000 IF A$="7" THEN 1020 ELSE 1080
1020 B=0:IF A=1 THEN 2280
1040 IF A=2 THEN PSET (X,Y):GOSUB 3140
1060 IF A=3 THEN GOSUB 3560
1080 IF A$="1" THEN 1100 ELSE 1160
1100 B=0:IF A=1 THEN 2460
1120 IF A=2 THEN PSET (X,Y):GOSUB 3200
1140 IF A=3 THEN GOSUB 3620
1160 IF A$="3" THEN 1180 ELSE 1240
1180 B=0:IF A=1 THEN 2640
1200 IF A=2 THEN PSET (X,Y):GOSUB 3260
1220 IF A=3 THEN GOSUB 3680
1240 IF A$="W" OR A$="w" THEN COLOR 16,1
1260 IF A$="R" OR A$="r" THEN COLOR 20,0
1280 IF A$="B" OR A$="b" THEN COLOR 17,1
1300 IF A$="P" OR A$="p" THEN COLOR 21,1
1320 IF A$="D" OR A$="d" THEN A=1:B=1:GOTO 560
1340 IF A$="E" OR A$="e" THEN A=2:PSET (X,Y):GET (X,Y)-(X,Y),PT%:GOTO 560
1360 IF A$="S" OR A$="s" THEN A=3:GOTO 560
1380 IF A$="C" OR A$="c" THEN CLS:PSET (X,Y)
1400 IF B=1 THEN 560
1420 IF A=1 THEN RETURN ELSE GOTO 560
1440 REM $Draw$Mode$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
1460 REM $6$$$$$$$$$$$$$$$$$$$$$$$$$$
1480 BEEP
1500 FOR X=X TO 319
1520 IF X=319 THEN 1560
1540 PSET (X,Y)
1560 GOSUB 560
1580 IF X=319 THEN 1560
1600 NEXT X
1620 REM $2$$$$$$$$$$$$$$$$$$$$$$$$$$
1640 BEEP
1660 FOR Y=Y TO 199
1680 IF Y=199 THEN 1720
1700 PSET (X,Y)
1720 GOSUB 560
1740 IF Y=199 THEN 1720
1760 NEXT Y
1780 REM $4$$$$$$$$$$$$$$$$$$$$$$$$$$
1800 BEEP
1820 FOR X=X TO 1 STEP -1
1840 IF X=1 THEN 1880
1860 PSET (X,Y)
```

More

makes for precise drawing.

To clear all lines off of the screen, hit the C key. This will leave one point on the screen.

Color Schemes

Four color combinations are possible with the Quick Draw! program.

For a blue background with a white foreground, press B. For a black background with a white foreground, hit W.

Pressing R gives you a red background with a yellow foreground. The P key will provide a magenta background with a cyan foreground.

Added Notes

Several factors of Quick Draw! are worth mentioning:

- The "beep" can be omitted if you find it annoying.
- Color can be changed to suit a color television.
- If the program does not respond to the keypad, press the number lock key.
- The clear command on line 260 should be adjusted to the maximum workspace and stack size available for the memory allotted.
- The picture produced on screen can be printed with any of the many screen print routines available.■

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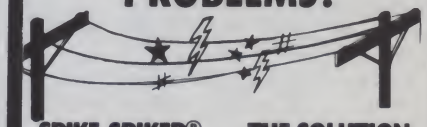

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Listing continued.

```
1880 GOSUB 560
1900 IF X=1 THEN 1880
1920 NEXT X
1940 REM *8************************
1960 BEEP
1980 FOR Y=Y TO 1 STEP -1
2000 IF Y=1 THEN 2040
2020 PSET (X,Y)
2040 GOSUB 560
2060 IF Y=1 THEN 2040
2080 NEXT Y
2100 REM *9************************
2120 IF X=319 OR Y=1 THEN 2240
2140 BEEP
2160 LET X=X +1
2180 LET Y=Y -1
2200 IF X=319 OR Y=1 THEN 2240
2220 PSET (X,Y)
2240 GOSUB 560
2260 IF X=319 OR Y=1 THEN 2240 ELSE 2160
2280 REM *7************************
2300 IF X=1 OR Y=1 THEN 2420
2320 BEEP
2340 LET X=X-1
2360 LET Y=Y-1
2380 IF X=1 OR Y=1 THEN 2420
2400 PSET (X,Y)
2420 GOSUB 560
2440 IF X=1 OR Y=1 THEN 2420 ELSE 2340
2460 REM *1************************
2480 IF X=1 OR Y=199 THEN 2600
2500 BEEP
2520 LET X=X-1
2540 LET Y=Y+1
2560 IF X=1 OR Y=199 THEN 2600
2580 PSET (X,Y)
2600 GOSUB 560
2620 IF X=1 OR Y=199 THEN 2600 ELSE 2520
2640 REM *3************************
2660 IF X=319 OR Y=199 THEN 2780
2680 BEEP
2700 LET X=X+1
2720 LET Y=Y+1
2740 IF X=319 OR Y=199 THEN 2780
2760 PSET (X,Y)
2780 GOSUB 560
2800 IF X=319 OR Y=199 THEN 2780 ELSE 2700
2820 REM *Editing*Mode*****************************************
2840 REM*6************************
2860 IF X=319 THEN RETURN ELSE 2880
2880 PUT (X,Y),PT%:X=X+1:PUT (X,Y),PT%:RETURN
2900 REM *2************************
2920 IF Y=199 THEN RETURN ELSE 2940
2940 PUT (X,Y),PT%:Y=Y+1:PUT (X,Y),PT%:RETURN
2960 REM *4************************
2980 IF X=1 THEN RETURN ELSE 3000
3000 PUT (X,Y),PT%:X=X-1:PUT (X,Y),PT%:RETURN
3020 REM *8************************
3040 IF Y=1 THEN RETURN ELSE 3060
3060 PUT (X,Y),PT%:Y=Y-1:PUT (X,Y),PT%:RETURN
3080 REM *9************************
3100 IF X=319 OR Y=1 THEN RETURN ELSE 3120
3120 PUT (X,Y),PT%:X=X+1:Y=Y-1:PUT (X,Y),PT%:RETURN
3140 REM *7************************
3160 IF X=1 OR Y=1 THEN RETURN ELSE 3180
3180 PUT (X,Y),PT%:X=X-1:Y=Y-1:PUT (X,Y),PT%:RETURN
3200 REM *1************************
3220 IF X=1 OR Y=199 THEN RETURN ELSE 3240
3240 PUT (X,Y),PT%:X=X-1:Y=Y+1:PUT (X,Y),PT%:RETURN
3260 REM *3************************
3280 IF X=319 OR Y=199 THEN RETURN ELSE 3300
3300 PUT (X,Y),PT%:X=X+1:Y=Y+1:PUT (X,Y),PT%:RETURN
3320 REM *Slow*Mode*****************************************
3340 REM *6************************
3360 X=X+1:GOTO 3740
3380 REM *2************************
3400 Y=Y+1:GOTO 3740
3420 REM *4************************
3440 X=X-1:GOTO 3740
3460 REM *8************************
3480 Y=Y-1:GOTO 3740
3500 REM *9************************
3520 IF Y=1 OR X=319 THEN RETURN ELSE 3540
3540 X=X+1:Y=Y-1:GOTO 3740
3560 REM *7************************
3580 IF Y=1 OR X=1 THEN RETURN ELSE 3600
3600 X=X-1:Y=Y-1:GOTO 3740
3620 REM *1************************
3640 IF X=1 OR Y=199 THEN RETURN ELSE 3660
3660 X=X-1:Y=Y+1:GOTO 3740
3680 REM *3************************
3700 IF X=319 OR Y=199 THEN RETURN ELSE 3720
3720 X=X+1:Y=Y+1:GOTO 3740
3740 IF X<1 THEN X=1
3760 IF X>319 THEN X=319
3780 IF Y<1 THEN Y=1
3800 IF Y>199 THEN Y=199
3820 PSET (X,Y):RETURN
3840 END
```

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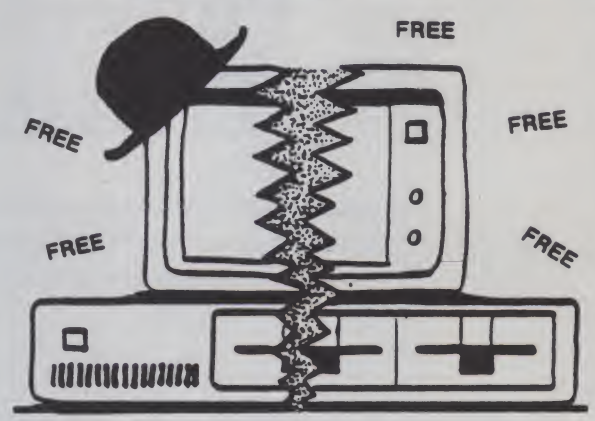

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Powerful Printer Transformation

If you're still using the popular MX-80 for just word processing, then it's time you transformed your machine into a powerful graphics printer and more with the Graftrax-80 chip.

By Jonathan Lederman

When I was first considering the purchase of a printer, I had a hard time deciding between Epson's MX-80 and MX-70. The MX-70 has the capability to print high-resolution graphics, but it lacks the word processing features of the MX-80.

Finally, I decided on the MX-80, hoping that Epson would release a graphics system for this printer. My wish came true with Epson's release of the Graftrax-80 graphics chip.

Graftrax-80

The graphics package comes with three 2716 EPROMs and a manual explaining operation of the system. After you install Graftrax-80 into your MX-80, you'll be able to print dot graphics in either a 480 or 960 point-per-line (ppl) resolution.

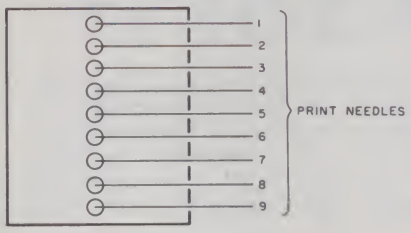

Fig. 1. Printhead of the MX-80.

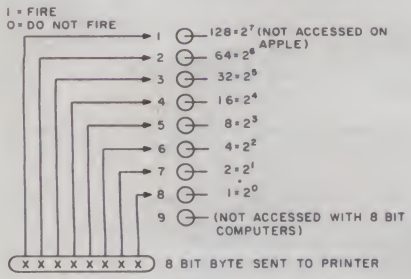

Fig. 2. The bits in the byte sent to the printer correspond to the needles that will fire on the printhead.

The capabilities of the system go far beyond printing graphics. For starters, you can select an alternate italic set instead of the standard set under software control. Also, all Apple users can now print the TRS-80 graphics character set, which was impossible before this chip.

Besides these improvements, Graftrax-80 allows you to mix emphasized and double-strike print or condensed and expanded print on the same line. Another feature the chip provides is a reduction in the duration of the annoying error bell, which is now one-third of a second instead of a full second.

Installing the EPROMs

Installation of the three EPROMs is easy. The only tools required are a Phillips screwdriver, an IC remover or flathead screwdriver and a pair of wire cutters.

First, remove the four screws holding the cover on the MX-80. Next, remove one ROM with the IC remover, insert the three EPROMs into their respective slots and cut one jumper. Graftrax-80 is now installed.

After you reset the DIP switches inside the printer, you can begin using the system. The complete procedure for installing Graftrax-80 is outlined thoroughly in the manual and diagrams of the appropriate chips to remove are shown. I am convinced that installation could be done by a beginner, but if you are an absolute novice, you might want to ask for advice from your local computer shop.

Graphics Capabilities

Once Graftrax-80 was installed, I was eager to begin producing graphics on the MX-80. The 480 ppl mode provides adequate resolution for most purposes. Since I was using the system from an Apple II, this mode certainly provided enough points across to dump the graphics screen. However, for enlargements of pictures and special effects, I found that 960 ppl resolution is more suitable.

After familiarizing yourself with Epson's bit graphics system, you'll probably agree that it's easier than it seems at first and that it's practical for printing graphics.

You access the graphics of the MX-80 by controlling the needles that will fire on the printhead. The printhead contains nine needles stacked one on top of another (see Fig. 1). By sending different ASCII codes to the printer, you can control which of these needles will "fire."

For example, one certain code will cause all of the needles to fire. If you looked at the paper close-up, you would see a group of dots stacked vertically and extremely close together. If you looked at it from farther away, it

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would appear to be a short vertical line.

The binary representation of the ASCII code sent to the printer corresponds with the needles that will fire. Each bit in the byte sent to the printer corresponds with one needle (see Fig. 2). If the bit is set, then the corresponding needle will fire; if it is a zero, it will not.

Say you wanted to send code number 65 to the printer. In binary, this number would be 01000001. The code would cause the second and eighth needles from the top of the printhead to fire because the second and eighth bits are set (see Fig. 2). Code number 65 happens to correspond with the letter A. The ninth needle cannot be addressed because one byte is made up of only eight bits; thus, the greatest ASCII code that could be sent to the printer would be 255, or 11111111, which would cause all of the needles on the printhead to fire.

Apple users have a further restriction when using Graftrax-80. Because of the way the printer interface was designed, only seven needles can be accessed. The eighth bit has no control over its corresponding needle. This restriction for Apple owners, however, is not serious and has little effect on the performance of the printer.

Before you can send any codes to the printer, you must select a graphics mode and the length of the graphics line you will be sending to the printer. I wanted to use the 480 ppl resolution with a line length of 280 points across the page (this length happens to correspond with the horizontal screen length of the Apple II in hi-res graphics). After getting the printer on line, the statement to set this mode would be PRINT CHR$(27); "K"; CHR$(24); CHR$(1);.

The CHR$(27) is the ASCII code for an escape character; it precedes many of the commands related to the MX-80 and indicates that the rest of the command refers to the printer. The next character tells the printer the resolution of the line you wish to use; "K" indicates 480 resolution ("L" would indicate the 960 ppl mode).

The next two codes, CHR$(24) and CHR$(1), tell the printer how long each horizontal line will be. It is important that you do not confuse the line length with the resolution. A 480 ppl resolution means that only 480 points across are available; you do not have to use all of the points.

The length of the line will turn out to be the code number of the first CHR$ statement, which is 24, added to 256 times the second one, which is a 1. Thus, the line length is set to $24+(256\times1)=280$. Epson chose this scheme (two arguments being sent to the printer) so that a line length greater than 255 would be available. If the second CHR$ had been 0, the line length would be set at $24+(256\times0)=24$ dots across.

With the 960 ppl resolution, the L character is substituted for the K and the last CHR$ can be 0, 1, 2 or 3. For example, if the line PRINT CHR$(27); "L";CHR$(100);CHR$(2); were sent to the printer, it would cause the MX-80 to enter the 960 ppl resolution and set a line length of $100+(256\times2)=612$ dots across.

You may notice that a line length greater than 960 may be sent to the printer by having the second CHR$ equal three and the first CHR$ greater than 192. If you attempt this, the printer will recognize the error and sound the error bell. (One annoying aspect of Graftrax-80 is that to clear an error condition such as the one mentioned above, you must turn the printer off and then on again.)

Once you have selected the line length at a value N, the next N characters the printer receives will be printed as graphics characters. However, the Apple and TRS-80 will not be

Listing 1. Super-Dump.Basic program.

```
10  REM  ************************
20  REM  *       SUPER-DUMP     *
30  REM  *                      *
40  REM  *   BY JON LEDERMAN    *
50  REM  *                      *
60  REM  *                      *
70  REM  ************************
80  REM
90  REM  USE OF THIS PROGRAM RE-
100  REM  QUIRES THE GRAFTRAX-80
110  REM  CHIP TO BE INSTALLED
120  REM  IN THE EPSON MX-80
130  REM  PRINTER
140  HIMEM: 8192:D$ =  CHR$ (4):FD = 0:PR = 1:DR = 1: POKE  - 16368,0
150  TEXT : HOME : NORMAL :OQ = 0:PL = 0
160 A$ = "*****************************************"
170 B$ = "-----------------------------------------"
180  PRINT A$;
190  PRINT "*                SUPER-DUMP              *";
200  PRINT "*                                        *";
210  PRINT "*   A GRAPHICS DUMP FOR ";: INVERSE : PRINT "GRAFTRAX-80";: NORMAL
     : PRINT "     *";
220  PRINT A$: POKE 34,6
230  PRINT : PRINT "OPTIONS:"
240  PRINT : PRINT
250 OP$(1) = "<1> LOAD PICTURE"
260 OP$(2) = "<2> SELECT PAGE"
270 OP$(3) = "<3> SELECT PRINT OPTIONS"
280 OP$(4) = "<4> DUMP SCREEN TO PRINTER"
290 OP$(5) = "<5> LOAD SUPER-DUMP MACHINE CODE"
300 OP$(6) = "<6> CHANGE PRINTER AND DRIVE OPTIONS"
310 OP$(7) = "<7> EXIT"
320  FOR C = 1 TO 7: PRINT OP$(C): NEXT C
330  VTAB 18
340  PRINT B$: PRINT "SUPER DUMP IS ";
350  IF FD = 1 THEN  FLASH : PRINT "INTACT";: NORMAL : PRINT "     ";: GOTO
     370
360  FLASH : PRINT "NOT INTACT"
370  NORMAL : PRINT : PRINT "PRINTER SLOT ";: INVERSE : PRINT PR
380  NORMAL : PRINT "DISK DRIVE   ";: INVERSE : PRINT DR: NORMAL
390  IF  PEEK ( - 16384) = 149 OR  PEEK ( - 16384) = 136 THEN  GOSUB 2070
400  IF  PEEK ( - 16384) = 141 THEN  ON PL GOTO 420,1030,1130,1340,1930,19
     90,2060
410  GOTO 390
420  TEXT : HOME : NORMAL
430  POKE  - 16368,0
440  PRINT "OPTIONS:"
450  PRINT
460  PRINT "1. CATALOG THE DISK"
470  PRINT
480  PRINT "2. LOAD PICTURE INTO MEMORY"
490  PRINT
500  PRINT "3. RETURN TO MAIN MENU"
510  PRINT : PRINT "4. VIEW HI-RES SCREEN"
520  PRINT
530  INPUT "CHOICE:";CH$:CH =  VAL (CH$)
540  IF CH < 1 OR CH > 4 OR CH <  > INT (CH) THEN  GOTO 420
550  IF CH = 1 THEN  GOTO 870
560  IF CH = 2 THEN  GOTO 590
570  IF CH = 4 THEN  GOTO 910
580  GOTO 140
590  HOME
600  PRINT : PRINT "OPTIONS:": PRINT
610  PRINT "1. HI-RES SCREEN 1"
620  PRINT "2. HI-RES SCREEN 2"
630  PRINT : INPUT "CHOICE:";CH$:CH =  VAL (CH$): IF CH < 1 OR CH > 2 OR C
     H <  > INT (CH) THEN 420
640  PRINT : INPUT "FILNAME:";FIL$
650  PRINT : PRINT "LOAD ";: INVERSE : PRINT FIL$: NORMAL : PRINT "INTO ";

660  INVERSE : IF CH = 1 THEN  PRINT "HI-RES PAGE 1"
```

More

Listing 1 continued.

```
670  IF CH = 2 THEN  PRINT "HI-RES PAGE 2"
680  NORMAL
690  PRINT : INPUT "IS THIS CORRECT?";QU$: IF  LEFT$ (QU$,1) = "N" THEN 42
     0
700  ONERR  GOTO 860
710  IF CH = 1 THEN  PRINT D$;"BLOAD";FIL$;",A8192";",D";DR
720  IF CH = 2 THEN  PRINT D$;"BLOAD";FIL$;",A16384";",D";DR
730  POKE 216,0
740  PRINT : INVERSE : PRINT FIL$;: NORMAL : PRINT " LOADED"
750  PRINT
760  PRINT "PRESS RETURN TO SEE THE PICTURE"
770  PRINT : PRINT "PRESS ESC TO RETURN TO THE MAIN MENU"
780 P =  PEEK ( - 16384): IF P <  > 155 AND P <  > 141 THEN 780
790  IF P = 155 THEN  GOTO 150
800  POKE  - 16304,0
810  IF CH = 2 THEN  POKE  - 16297,0: POKE  - 16299,0: POKE  - 16302,0: GOTO
     830
820  POKE  - 16297,0: POKE  - 16300,0: POKE  - 16302,0
830  IF  PEEK ( - 16384) <  > 155 THEN 830
840  GOTO 150
850  END
860  PRINT : INVERSE : PRINT "DISK ERROR"; CHR$ (7); CHR$ (7): NORMAL : FOR
     C = 1 TO 2000: NEXT C: GOTO 420
870  HOME : PRINT D$;"CATALOG,D";DR
880  FLASH : PRINT "PRESS RETURN TO PROCEED..."
890  IF  PEEK ( - 16384) <  > 141 THEN 890
900  GOTO 420
910  HOME : PRINT : PRINT "TYPE ESC TO RETURN TO MENU"
920  PRINT : PRINT "TYPE NUMBER OF SCREEN TO VIEW"
930  PRINT
940  PRINT "TYPE 3 TO RETURN TO 'LOAD' MENU"
950 X =  PEEK ( - 16384) - 176: IF X <  > 1 AND X <  > 2 AND X <  > 3 THEN
     950
960  POKE  - 16368,0
970  IF X = 3 THEN  GOTO 420
980  IF X = 1 THEN  POKE  - 16300,0
990  IF X = 2 THEN  POKE  - 16299,0
1000  POKE  - 16297,0: POKE  - 16302,0: POKE  - 16304,0
1010 X =  PEEK ( - 16384): IF X <  > 155 THEN 1010
1020  POKE  - 16300,0: POKE  - 16303,0: GOTO 910
1030  HOME : NORMAL
1040  PRINT : PRINT
1050  PRINT "HI-RES PAGE TO PRINT (1 OR 2)"
1060 PG =  PEEK ( - 16384) - 176: IF PG <  > 1 AND PG <  > 2 THEN 1060
1070  PRINT : PRINT "PAGE ";: INVERSE : PRINT PG;: NORMAL : PRINT " WILL B
     E SENT TO THE PRINTER"
1080  PRINT : PRINT : PRINT "PRESS RETURN FOR MAIN MENU"
1090  PRINT : PRINT "PRESS ESC TO SELECT PAGE"
1100 V =  PEEK ( - 16384): IF V <  > 141 AND V <  > 155 THEN 1100
1110  IF V = 155 THEN  GOTO 1030
1120  GOTO 150
1130  HOME : NORMAL : POKE  - 16368,0: PRINT : INPUT "INVERSE OR NORMAL (I
     /N)";OP$
1140  IF OP$ <  > "I" AND OP$ <  > "N" THEN 1130
1150  PRINT : PRINT "HORIZONTAL EXPANSION (1-4)"
1160 HE =  PEEK ( - 16384) - 176: IF HE < 1 OR HE > 4 THEN 1160
1170  POKE  - 16368,0
1180  PRINT : PRINT "VERTICAL EXPANSION (1-7)"
1190 VE =  PEEK ( - 16384) - 176: IF VE < 1 OR VE > 7 THEN 1190
1200  POKE  - 16368,0
1210  PRINT : PRINT "TABBING (1-";: IF HE = 4 THEN  PRINT 50;
1220  IF HE <  > 4 THEN  PRINT 100;
1230  PRINT ")";: INPUT TB$:TB =  VAL (TB$): IF TB < 1 OR (TB > 50 AND HE =
     4) OR (TB > 100) THEN 1130
1240  PRINT : PRINT "PICTURE TO BE PRINTED ";: INVERSE : IF OP$ = "I" THEN
      PRINT "INVERSELY"
1250  IF OP$ = "N" THEN  PRINT "NORMALY"
1260  NORMAL
1270  PRINT "WITH A HORIZONTAL EXPANSION OF ";: INVERSE : PRINT HE: NORMAL

1280  NORMAL : PRINT "AND WITH A VERTICAL EXPANSION OF ";: INVERSE : PRINT
     VE: NORMAL
1290  PRINT "TABBING SET AT ";: INVERSE : PRINT TB: NORMAL
1300  POKE  - 16368,0
1310  PRINT : INPUT "IS THIS CORRECT?";CH$
1320  IF  LEFT$ (CH$,1) = "N" THEN  GOTO 1130
1330 SD = 1: GOTO 150
1340  HOME : IF SD = 0 OR FD = 0 OR PG = 0 THEN  GOTO 150
1350  IF HE = 1 OR HE = 2 THEN LG = 280
1360  IF HE = 3 OR HE = 4 THEN LG = (HE - 1) * 280
1370 N = ((LG + TB) / 256) -  INT ((LG + TB) / 256):N1 = 256 * N:N2 =  INT
     ((LG + TB) / 256)
1380  IF HE = 2 THEN P$ = "K": GOTO 1400
1390 P$ = "L"
1400  POKE 24880,TB: IF OP$ = "I" THEN  POKE 24870,0: POKE 24872,(2 ^ VE) -
     1: GOTO 1420
1410  POKE 24870,(2 ^ VE) - 1: POKE 24872,0
1420  POKE 24871,(LG / 280):M = PG * 8192
1430  IF OP$ = "I" THEN  INVERSE : PRINT ,,"INVERSE": NORMAL : GOTO 1450
1440  NORMAL : PRINT ,,"NORMAL"
1450  PRINT "PAGE",,: INVERSE : PRINT PG: NORMAL
1460  PRINT "HORIZONTAL EXPANSION",: INVERSE : PRINT HE: NORMAL
1470  PRINT "VERTICAL EXPANSION",: INVERSE : PRINT VE: NORMAL
1480  PRINT "TABBING",,: INVERSE : PRINT TB: NORMAL
1490  PRINT "PRINTER SLOT",,: INVERSE : PRINT PR: NORMAL
1500  PRINT B$: POKE 34,13
1510  PRINT : INVERSE : PRINT "TURN PRINTER ON OR OFF AND THEN ON": NORMAL
     : PRINT : PRINT "POSITION PAPER": POKE  - 16368,0
1520  PRINT : PRINT "PRESS RETURN TO START DUMP ESC TO EXIT"
1530 X =  PEEK ( - 16384): IF X <  > 155 AND X <  > 141 THEN 1530
1540  IF X = 155 THEN 150
1550  POKE  - 16368,0
```

More

able to pass certain codes to the printer, since specific control codes are reserved. For example, the Apple could not send a CHR$(13) because this code refers to a carriage return.

In the MX-80 user's manual, Epson outlines a method for getting around this hindrance. Two special locations are given. The first (49296 for the Apple and 14312 for the TRS-80) is the location where the printer looks for character data. By poking a 13 into the address, this code can be sent to the printer without the use of a PRINT CHR$(13), which would invoke a carriage return.

Another address (49601 for the Apple) must be examined with a Peek statement to determine whether the character data poked into the first address has been picked up by the printer. On the Apple, when this Peek becomes a value greater than 0 (bit 8 set to 0), it indicates that the printer has picked up the code.

The TRS-80 uses a similar scheme to determine whether the printer has received the data. A sample program is provided in the manual.

(By the way, the Apple program has three mistakes in it. The three PEEK (49296)s in lines 40, 60 and 90 should be changed to PEEK(49601)s.)

One final graphics capability of Graftrax-80 is a 960 dot-per-line (dpl) resolution printed at 480 ppl speed. The 960 ppl mode prints only half as fast as the 480 dpl mode. The dots in the 960 mode aren't actually smaller but are printed closer together, with a slight overlap, to create the illusion of a smoother and finer picture.

Epson's manual talks very little about this super-fast 960 dpl mode and indicates that it can be used only from a machine-language driver. It also points out the many problems created by using this mode. I attempted to use it from machine language, but I was unsuccessful. You might want to experiment with this mode; it's accessed with ESC-J.

One final note on graphics: you must reset the vertical line spacing so that each line is printed under the previous line with no gaps in between. This is done with the command PRINT CHR$(27);''3'';CHR$(N);.

Other Capabilities of Graftrax-80

Besides its powerful graphics capabilities, Graftrax-80 allows you to select an alternate italic character set. You can access this set with the command PRINT CHR$(27);''4'' preceding the text you want to print in italic.

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Listing 1 continued.

```
1560  POKE  - 16297,0: POKE  - 16302,0: POKE ( - 16301 + PG),0: POKE  - 16
      304,0
1570  PR# PR
1580  IF VE > 1 THEN Q = 24:R = 8: GOTO 1750
1590  PRINT  CHR$ (27);"3";
1600  POKE 49296,21
1610  IF  PEEK (49601) <  = 0 THEN 1610
1620 Q = 1:R = 3
1630  FOR CA = 0 TO 26
1640  IF  PEEK ( - 16384) = 155 THEN  GOTO 1920
1650  PRINT  CHR$ (27);P$; CHR$ (N1); CHR$ (N2);
1660  CALL 24843
1670  IF (CA / 8) =  INT (CA / 8) THEN 1700
1680  IF CA = 9 OR CA = 18 THEN M = M - 856: GOTO 1700
1690 M = M + 128
1700 A = M -  INT (M / 256) * 256:B = (M - A) / 256: POKE 7,A: POKE 8,B: POKE
     9,CA - 8 *  INT (CA / 8): POKE 24869,B
1710  CALL 24576
1720  IF CA = 26 THEN 1750
1730  PRINT  CHR$ (0); CHR$ (13);: POKE 24867, PEEK (8): POKE 24866, PEEK
     (7) - 40
1740  NEXT CA
1750  PRINT  CHR$ (27);"3";
1760  POKE 49296,3 * VE
1770  IF  PEEK (49601) <  = 0 THEN 1770
1780  PRINT  CHR$ (0); CHR$ (13);
1790  IF VE = 1 THEN M = M + 5120
1800 M = M - 128
1810  PRINT  CHR$ (27);P$; CHR$ (N1); CHR$ (N2);
1820  FOR CA = 1 TO Q
1830  IF CA = 9 OR CA = 17 THEN M = M - 856: GOTO 1850
1840 M = M + 128
1850  FOR Y = 1 TO R
1860  IF  PEEK ( - 16384) = 155 THEN  GOTO 1920
1870 AD = (Y - 1) * 1024 + M:A = AD -  INT (AD / 256) * 256:B = (AD - A) /
     256
1880  POKE 7,A: POKE 8,B: CALL 24843: CALL 24759
1890  PRINT  CHR$ (13);: PRINT  CHR$ (27);P$; CHR$ (N1); CHR$ (N2);
1900  NEXT Y
1910  NEXT CA
1920  PR# 0: GOTO 150
1930  HOME : PRINT : PRINT : INVERSE : PRINT "LOADING MACHINE CODE"
1940  ONERR  GOTO 1980
1950  PRINT D$;"BLOAD SUPER-DUMP.MC";",D";DR
1960 FD = 1: POKE 216,0
1970  GOTO 150
1980  INVERSE : PRINT "DISK ERROR": NORMAL : PRINT  CHR$ (7); CHR$ (7): FOR
     C = 1 TO 2000: NEXT C: GOTO 150
1990  HOME : NORMAL : PRINT : PRINT
2000  PRINT "PRINTER SLOT (1-6)"
2010 PR =  PEEK ( - 16384) - 176: IF PR > 7 OR PR < 1 THEN 2010
2020  POKE  - 16368,0
2030  PRINT : PRINT "DISK DRIVE (1 OR 2)"
2040 DR =  PEEK ( - 16384) - 176: IF DR <  > 1 AND DR <  > 2 THEN 2040
2050  GOTO 150
2060  TEXT : HOME : PRINT : PRINT : INVERSE : PRINT "TO RESTART, TYPE RUN"
     : NORMAL : PRINT : PRINT : END
2070 OQ = PL
2080  IF  PEEK ( - 16384) = 149 THEN PL = PL + 1: GOTO 2100
2090 PL = PL - 1
2100  IF PL = 0 THEN PL = 7
2110  IF PL < 0 THEN PL = PL + 8
2120  IF PL = 8 THEN PL = 1
2130  VTAB 10 + OQ: NORMAL : PRINT OP$(OQ)
2140  VTAB 10 + PL: INVERSE : PRINT OP$(PL)
2150  POKE  - 16368,0
2160  RETURN
```

Listing 2. Super-Dump.MC program.

```
SOURCE FILE: SUPER DUMP2
0000:              1 *SUPER
0000:              2 *DUMP
0000:              3 *ROUTINE
0000:              4 *BY
0000:              5 *JON
0000:              6 *LEDERMAN
0000:              7 *ROUTINE STARTING
0000:              8 *AT
0000:              9 **$6000
0000:             10 *FOR
0000:             11 *USE
0000:             12 *WITH
0000:             13 *GRAF
0000:             14 *TRAX
0000:             15 *80
----- NEXT OBJECT FILE NAME IS SUPER-DUMP.MC
6000:             16          ORG  $6000
6000:A9 00        17          LDA  #$00
6002:8D 24 61     18          STA  $6124
6005:A5 09        19 TEST     LDA  $09
6007:C9 00        20          CMP  #$00
6009:D0 5A        21          BNE  SWITCH
600B:A0 00        22 INIT     LDY  #$00
600D:84 06        23          STY  $06
600F:A2 00        24          LDX  #$00
6011:A1 07        25 START    LDA  ($07,X)
6013:20 8F 60     26          JSR  ROTATE
6016:4C 52 60     27          JMP  ADD
6019:C6 09        28 BLOW     DEC  $09
601B:A5 09        29          LDA  $09
601D:C9 00        30          CMP  #$00
601F:F0 57        31          BEQ  SWITCH1
6021:C8           32 BACK     INY
6022:C0 07        33          CPY  #$07
6024:D0 EB        34          BNE  START
6026:A2 00        35          LDX  #$00
6028:20 97 60     36          JSR  TESTINV
602B:A0 00        37 MAIN     LDY  #$00
602D:84 06        38          STY  $06
602F:B9 F9 00     39 BEG      LDA  $F9,Y
6032:20 8F 60     40          JSR  ROTATE
6035:C8           41          INY
6036:C0 07        42          CPY  #$07
6038:D0 F5        43          BNE  BEG
603A:E8           44          INX
603B:20 97 60     45          JSR  TESTINV
603E:E0 06        46          CPX  #$06
6040:D0 E9        47          BNE  MAIN
6042:E6 07        48          INC  $07
6044:EE 22 61     49          INC  $6122
6047:EE 24 61     50          INC  $6124
604A:AD 24 61     51          LDA  $6124
604D:C9 28        52          CMP  #$28
604F:D0 30        53          BNE  WARM
6051:60           54          RTS
6052:18           55 ADD      CLC
6053:A5 0B        56          LDA  $0B
6055:69 04        57          ADC  #$04
```

More

In addition, Graftrax-80 allows you to mix expanded and compressed print or double-strike and emphasized print on the same line. The codes to access these print styles have been changed. One new command allows you to redefine the escape codes to access the various features of the printer. For example, you could tell the printer that you wanted the code CHR$(8)—instead of CHR$(4)—to access the italics set. All subsequent uses of PRINT CHR$(8) would then access the italics set.

Documentation

The documentation supplied with Graftrax-80 is adequate, although not extensive. The information, supplied in a 23-page booklet, includes a list with each command and its appropriate escape sequences. Some of the less straightforward commands are accompanied by examples explaining how to use them.

In some cases, diagrams are provided to make operation of the system clear. If you have had no experience with the MX-80, the manual suggests that you read the *Epson MX-80 Printer User's Manual*, by D.A. Lien. Also, to use Graftrax-80 effectively, an understanding of the Basic language is recommended.

Super-Dump

Super-Dump, a program I wrote for the Apple II computer, provides a high-resolution screen dump of either hi-res page 1 or 2. Using this program, you can choose to print a hi-res picture in normal or reverse print with different horizontal and vertical expansions plus tabbing.

Super-Dump is divided into two parts. Super-Dump.Basic is an Applesoft program that utilizes a machine-language subroutine called Super-Dump.MC. To use the program, you need a 32K Apple II with Applesoft Basic. Type in the Basic program (as shown in Listing 1), and save this program to disk, calling it Super-Dump. Basic. If you have an assembler, type in and assemble Listing 2, calling it Super-Dump.MC.

If you do not have access to an assembler, you can type directly in the HEX-codes (as shown in Listing 3), starting at $6000 HEX (24576 decimal). Save this program with the command BSAVE "SUPER-DUMP. MC";A$6000,L$122. To run the program, type RUN SUPER-DUMP. BASIC.

After the program is loaded, the

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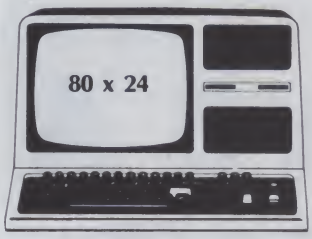

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Listing 2 continued.

```
6057:85 08      58          STA  $08
6059:4C 19 60   59          JMP  BLOW
605C:8D 90 C0   60 PRINT    STA  $C090
605F:AD C1 C1   61 WAIT     LDA  $C1C1
6062:30 FB      62          BMI  WAIT
6064:60         63          RTS
6065:A5 07      64 SWITCH   LDA  $07
6067:48         65          PHA
6068:A5 08      66          LDA  $08
606A:48         67          PHA
606B:AD 22 61   68          LDA  $6122
606E:85 07      69          STA  $07
6070:AD 23 61   70          LDA  $6123
6073:85 08      71          STA  $08
6075:4C 08 60   72          JMP  INIT
6078:68         73 SWITCH1  PLA
6079:85 08      74          STA  $08
607B:68         75          PLA
607C:85 07      76          STA  $07
607E:4C 21 60   77          JMP  BACI
6081:A5 09      78 WARM     LDA  $09
6083:69 07      79          ADC  #$07
6085:85 09      80          STA  $09
6087:AD 25 61   81          LDA  $6125
608A:85 08      82          STA  $08
608C:4C 05 60   83          JMP  TEST
608F:18         84 ROTATE   CLC
6090:4A         85          LSR  A
6091:99 F9 00   86          STA  $F9,Y
6094:26 06      87          ROL  $06
6096:60         88          RTS
6097:8A         89 TESTINV  TXA
6098:48         90          PHA
6099:AE 27 61   91          LDX  $6127
609C:AD 26 61   92 INV      LDA  $6126
609F:C9 00      93          CMP  #$00
60A1:F0 0D      94          BEQ  EXO
60A3:A5 06      95          LDA  $06
60A5:20 5C 60   96 GOPRNT   JSR  PRINT
60A8:CA         97          DEX
60A9:E0 00      98          CPX  #$00
60AB:D0 EF      99          BNE  INV
60AD:68        100          PLA
60AE:AA        101          TAX
60AF:60        102          RTS
60B0:A5 06     103 EXO      LDA  $06
60B2:49 FF     104          EOR  #$FF
60B4:4C A5 60  105          JMP  GOPRNT
60B7:A9 00     106 SINGLE   LDA  #$00
60B9:8D 24 61  107          STA  $6124
60BC:85 06     108          STA  $06
60BE:A0 07     109 WARM1    LDY  #$07
60C0:A2 00     110          LDX  #$00
60C2:A1 07     111          LDA  ($07,X)
60C4:85 06     112          STA  $06
60C6:18        113 START1   CLC
60C7:A5 06     114          LDA  $06
60C9:4A        115          LSR  A
60CA:85 06     116          STA  $06
60CC:20 E1 60  117          JSR  PREPR
60CF:88        118 TEST1    DEY
60D0:C0 00     119          CPY  #$00
60D2:D0 F2     120          BNE  START1
60D4:EE 24 61  121          INC  $6124
60D7:E6 07     122          INC  $07
60D9:AD 24 61  123          LDA  $6124
60DC:C9 28     124          CMP  #$28
60DE:D0 DE     125          BNE  WARM1
60E0:60        126          RTS
60E1:B0 03     127 PREPR    BCS  SET
60E3:4C 02 61  128          JMP  NOSET
60E6:AD 26 61  129 SET      LDA  $6126
60E9:8D 29 61  130          STA  $6129
60EC:AE 27 61  131 PRINX    LDX  $6127
60EF:AD 29 61  132 LOOP     LDA  $6129
60F2:8D 90 C0  133          STA  $C090
60F5:AD C1 C1  134 WAIT1    LDA  $C1C1
60F8:30 FB     135          BMI  WAIT1
60FA:CA        136          DEX
60FB:E0 00     137          CPX  #$00
60FD:D0 F0     138          BNE  LOOP
60FF:A2 00     139          LDX  #$00
6101:60        140          RTS
6102:AD 28 61  141 NOSET    LDA  $6128
6105:8D 29 61  142          STA  $6129
6108:4C EC 60  143          JMP  PRINX
610B:8A        144 TAB      TXA
610C:48        145          PHA
610D:AE 30 61  146          LDX  $6130
6110:A9 00     147 SPACE    LDA  #$00
6112:8D 90 C0  148          STA  $C090
6115:AD C1 C1  149 WAIT2    LDA  $C1C1
6118:30 FB     150          BMI  WAIT2
611A:CA        151          DEX
611B:E0 00     152          CPX  #$00
611D:D0 F1     153          BNE  SPACE
611F:68        154          PLA
6120:AA        155          TAX
6121:60        156          RTS
```

screen will be filled with a list of seven options. Use the left and right arrow keys to choose your option. Press the return key when your selection is displayed in reverse. At the bottom of the screen, the current drive number and printer slot are displayed. Both are given a default value of 1.

Also, if Super-Dump.MC has been loaded, the message "Super-Dump is Intact" will be displayed. Or, if you have not loaded the code, "Super-Dump is Not Intact" will appear. Option 1 allows you to catalog a disk, load a picture or display either one of the hi-res screens. You can load a picture into either page. By using option 2, you tell Super-Dump which page you wish to print out.

Next, you must use option 3 (select print options) to choose how you want the picture printed. After you select this option, the computer will ask you whether you want to print in reverse (white on black) or normal (black on white). Then you select the horizontal expansion (1–4). Expansion 1 uses the 960 ppl resolution and prints one dot horizontally for each pixel on the screen. When using this expansion, your picture will appear to be slightly

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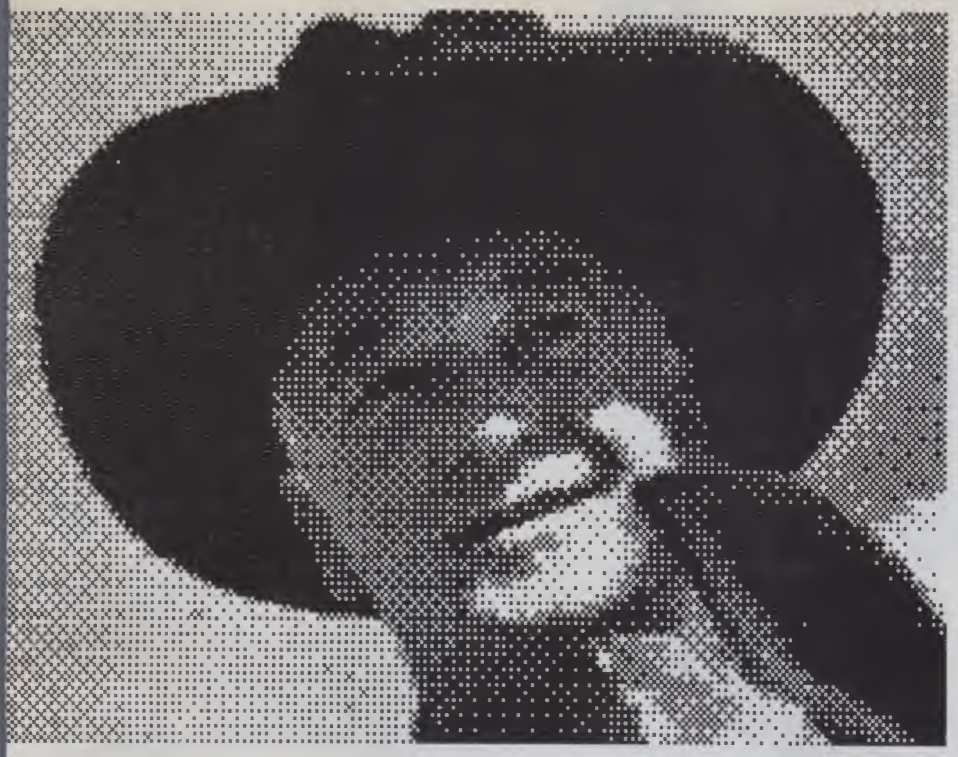

Example 1. This reproduction of William Boyd, the actor who portrayed the fictitious cowboy Hopalong Cassidy in the 1940s and 1950s, was printed in reverse with the Super-Dump program.

shrunken and distorted.

Horizontal expansion 2 uses 480 ppl resolution and also prints one dot per pixel. With horizontal expansion 3, the picture will be printed in 960 ppl resolution, but it will print two dots horizontally for each pixel. This expansion will appear to be close to horizontal expansion 2, but with a slightly higher resolution.

Horizontal expansion 4 is also 960 ppl resolution with three dots horizontally per pixel on the screen. This is the best for horizontal blow-ups. Next, Super-Dump prompts you for the vertical expansion. Select a number between 1 and 7. The higher the number you choose, the greater the vertical expansion.

Select the tabbing between 1 and the value printed. With greater horizontal expansions, the computer will automatically select a lower maximum tabbing.

After you have selected these options, Super-Dump will print the ones you have chosen and ask you if they are correct. If you make a mistake, type N and press return and the program will ask you to select again. If the options are correct, type Y and then return; this will leave you at the main menu.

Any combination of horizontal and vertical expansions with different tabbings are acceptable. When you have selected the page and print options, load Super-Dump.MC. When you select this option, Super-Dump.Basic will automatically load the machine-language code into the correct addresses.

And Finally...

Finally, you're ready to dump the screen. Select this option. If you have not selected the screen page or print options or have not loaded the machine code, selecting this option will have no effect. Otherwise, the print options you have selected will be displayed. You may press ESC to abort to the main menu at any time during or before printing.

If you decide to continue with the dump, turn on the printer. If the printer was on, turn it off and then on again to clear any data that may have accumulated in the print buffer. Position the paper, using the line and form-feed controls.

When these have been set, get the printer on line and press the return key, and the program will begin to dump the graphics screen you have selected. The picture will be displayed on the screen during the dump; afterwards, the program will return to the main menu.

Option 6 is used to change the printer slot and drive number. All operations with the disk drives will use the drive selected and the program will send the print data to the slot you have indicated. Option 7 exits the program.

Dumping different pictures with Super-Dump requires you to select different print options for the best effect. For example, the Hopalong Cassidy picture (see Example 1) looks best when printed in reverse. A vertical expansion of about 3 or 4 will fill a page vertically. Remember, though, that you trade off resolution when you choose higher horizontal and vertical expansions. You can experiment with different tab settings to achieve the best effect. Also, you might want to keep a "picture disk" full of your favorite hi-res pictures to be dumped at your convenience.

To gain a more thorough idea of the structure of Super-Dump, you should examine the listings. The Apple uses 40 bytes to store each horizontal line of graphics. Each byte corresponds to seven dots horizontally across the screen. Seven of the bits are used to indicate which points are lit, with the eighth bit corresponding to the color of the byte.

The bits are stored with the least-significant bit first and the seventh bit last. If the corresponding bit is set, a

```
6000- A9 00 8D 24 61 A5 09 C9
6008- 00 D0 5A A0 00 84 06 A2
6010- 00 A1 07 20 8F 60 4C 52
6018- 60 C6 09 A5 09 C9 00 F0
6020- 57 C8 C0 07 D0 EB A2 00
6028- 20 97 60 A0 00 84 06 B9
6030- F9 00 20 8F 60 C8 C0 07
6038- D0 F5 E8 20 97 60 E0 06
6040- D0 E9 E6 07 EE 22 61 EE
6048- 24 61 AD 24 61 C9 28 D0
6050- 30 60 18 A5 08 69 04 85
6058- 08 4C 19 60 8D 90 C0 AD
6060- C1 C1 30 FB 60 A5 07 48
6068- A5 08 48 AD 22 61 85 07
6070- AD 23 61 85 08 4C 0B 60
6078- 68 85 08 68 85 07 4C 21
6080- 60 A5 09 69 07 85 09 AD
6088- 25 61 85 08 4C 05 60 18
6090- 4A 99 F9 00 26 06 60 8A
6098- 48 AE 27 61 AD 26 61 C9
60A0- 00 F0 0D A5 06 20 5C 60
60A8- CA E0 00 D0 EF 68 AA 60
60B0- A5 06 49 FF 4C A5 60 A9
60B8- 00 8D 24 61 85 06 A0 07
60C0- A2 00 A1 07 85 06 18 A5
60C8- 06 4A 85 06 20 E1 60 88
60D0- C0 00 D0 F2 EE 24 61 E6
60D8- 07 AD 24 61 C9 28 D0 DE
60E0- 60 B0 03 4C 02 61 AD 26
60E8- 61 8D 29 61 AE 27 61 AD
60F0- 29 61 8D 90 C0 AD C1 C1
60F8- 30 FB CA E0 00 D0 F0 A2
6100- 00 60 AD 28 61 8D 29 61
6108- 4C EC 60 8A 48 AE 30 61
6110- A9 00 8D 90 C0 AD C1 C1
6118- 30 FB CA E0 00 D0 F1 68
6120- AA 60
*
```

Listing 3. Super-Dump routine for use without an assembler.

point appears on the screen and if it is 0, the point is dark. The only confusing area is how the high-resolution screen is mapped. Consult the *Apple II Reference Manual* for an explanation.

Now look at Fig. 3. This group of seven bytes might correspond to a chunk of screen memory.

Assume the top byte (1010101) is in location 8192 and the succeeding bytes are stacked vertically below this byte. Super-Dump scans vertically down seven horizontal lines at a time. Using the machine-language ROL and LSR instructions, it assembles the first seven vertical bits into a byte to be sent to the printer. Remember, if a bit is set to 1, then the point is lit. Thus, each vertical bit on the screen actually corresponds to one print needle on the printer.

The first value that would be sent to the printer would be 89, or 1011001. Note that on the Apple, the eighth needle cannot be addressed.

The second byte sent to the printer would be 52, or 0110100. This process is repeated eight times for each chunk of memory and 280 times for each horizontal line on the screen.

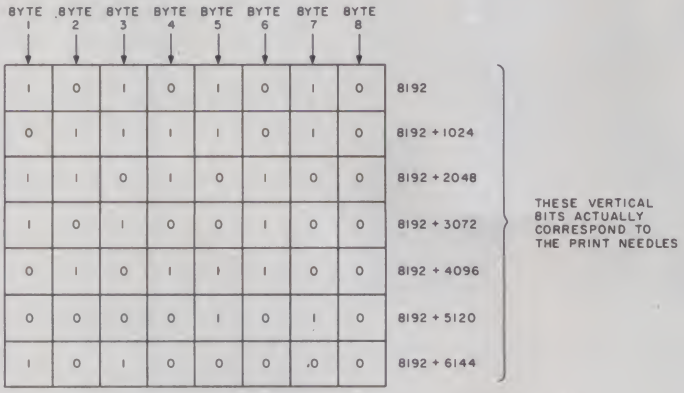

Fig. 3. A chunk of screen memory (as Super-Dump sees it) waiting to be assembled and sent to the printer.

Machine language is used for this part because of its high speed. Another interesting idea you should keep in mind when using this dump routine is that different combinations of odd or even bit settings will result in different colors. For example, green is made by plotting only in the odd columns. When Super-Dump looks at a green line, it "sees" only the odd columns lit and thus plots dots with very small spaces in between.

This idea works well in that it provides pseudo-color to the plotted picture. Different colors on the screen receive different textures, which appear as different shades of gray when printed out. Consult the Apple reference manual for the actual combination to produce these different colors.

To print horizontal expansions, Super-Dump simply prints more than one dot horizontally for each dot on the screen. Vertical expansion is a bit more complicated; instead of printing the seven horizontal lines with each pass, only one is printed.

Taller blocks are used to achieve the vertical expansion. Thus, if the ver-

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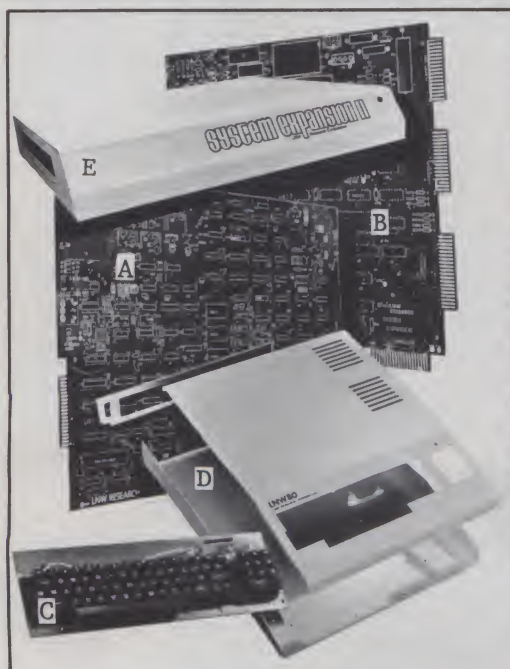

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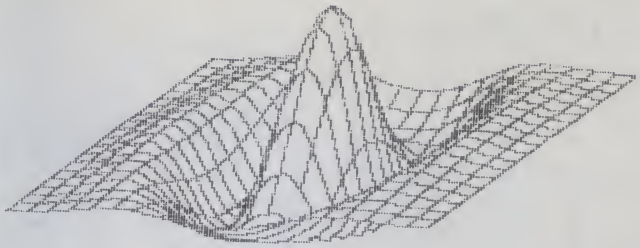

Examples 2 and 3. Two samples of graphics capabilities of Epson's MX-80. These graphics are made possible by the Graftrax-80 chip and the Super-Dump program. Super-Dump, written by the author for the Apple II, provides a high-resolution screen dump.

tical expansion is set to any number greater than 1, the print time increases dramatically to about ten minutes instead of the usual 45 seconds for vertical expansions of 1.

You should use vertical expansion greater than 1 only when a large blow-up is needed. When you need this feature, you will find that the wait is worth it—and picture quality is high.

A reverse is achieved by using the exclusive function in machine language to produce a negative image. Tabbing is done by sending a series of CHR$(0) strings to the printer.

What else can you do with Graftrax-80? The possibilities are practically limitless. How about a lo-res dump for the Apple using TRS-80 graphics characters? Or even better, how about a program to take the lo-res screen and print it out as hi-res graphics? You might want to try a program that stores a few graphics screens at a time and prints them out as one hi-res picture. Using the techniques presented in this article, you could probably do these programs without much difficulty.

Conclusion

Is Graftrax-80 worth getting? Well, for about $100, you can increase the capabilities of the MX-80 many times—and turn it into the most versatile printer for your money.■

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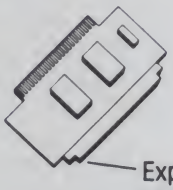

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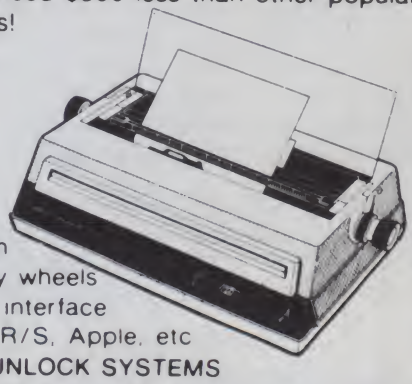

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If you're suffering from this dreaded disease, here's a simple hardware trick that will have you and your computer feeling tip-top in no time at all.

By Jim Stephens

How many times have you typed in a long program only to have it wiped out in a blink of the screen before it is saved? This is one of the many symptoms of the dreaded disease known as "ZX Wobble" (or, if you prefer, the "TS Wobble").

Other symptoms include programs failing to load and trash appearing in the middle of your Basic lines. It happens because a momentary "twitch" of the 16K RAM pack can throw garbage into the variable storage area; this usually makes the little micro ill. But, there is a cure for this unpredictable sickness.

When Sinclair researchers designed the ZX-81, they knew that the memory module would need physical support. They even designed the case with a bracket attachment that was to take the weight and firmly attach the module.

However, something went wrong. The bracket was left off and the customer and the RAM pack were left hanging. They *did* get the bracket attachment holes, but they're on the wrong side! Still, the idea was good, and all we actually need is the rigid bracket to make the terrible glitches go away.

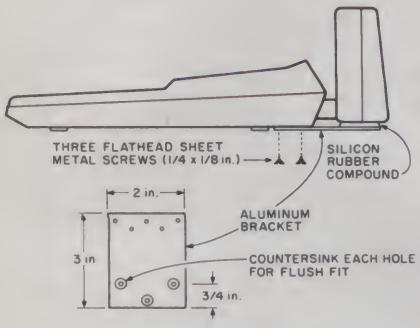

Fig. 1. Procedure of attachment of support bracket to the ZX-81 (TS-1000).

Before we attach a permanent support, however, one other problem associated with ZX Wobble must be corrected: oxidation. Copper has a tendency to grow a coat of green crud; for this reason, the manufacturer recommends cleaning the copper foil at the connector before the RAM pack is connected.

Eliminating Oxidation

Oxidation can be cured, too.

Copper oxide is caused by air and moisture coming into contact with copper. The result is a blue-green haze that is almost impervious to electrical current. The method of eliminating this oxide is simple.

First, take an eraser and clean the copper fingers at the connector. Cover the copper connector foils with a generous coating of silicone heat-sink compound. This special white "grease" is sold by most electronics parts stores; it's nonconductive, yet it allows metal-to-metal contact. It can be messy, but it keeps moisture away from the copper and cures oxidation.

The Support Bracket

The necessary dimensions of the needed bracket are shown in Fig. 1. It should be cut from hard aluminum and should be at least 1/16-inch thick. This thickness is necessary to prevent bending.

Drill eight 1/8-inch holes in the aluminum bracket and obtain three flathead 1/4 × 1/8-inch sheet metal screws for the attachment to the bottom of the case. Countersink these holes as in Fig. 1.

Before the case is drilled with a 3/32-inch bit, the bottom of the case should be removed to avoid damage to the circuit board. Use the bracket as a template and mark the screw locations. Drill the case holes and sand the areas around the points where the screws penetrate the case bottom. The silver coating is conductive, so if it touches the screws, it will ground the bracket and could cause glitches if the bracket is touched by you.

Replace the case bottom and apply the heat sink compound. Attach the RAM pack snugly to its connector and attach the bracket to the bottom of the case. The bracket will fit between the plastic feet on the RAM pack.

There should now be about 1/8-inch clearance between the module and the new bracket. This space is filled with either clear or black Dow silicone rubber. The five holes on the module end of the bracket give a grip for the silicone rubber. This method is used because the disassembly and drilling of the RAM pack is not recommended.

Allow the silicone rubber to dry in an upright position overnight. The result will be a wobble-free RAM pack that will withstand all of the banging of the keyboard that the kids can dish out.■

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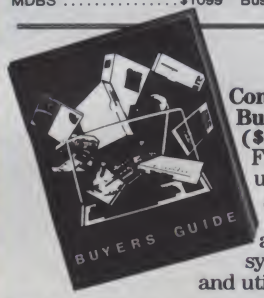

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Pocket-Size Floppies: Revolution or Rip-Off?

Micro floppies may be cute, but do we really need them? Well, many disk manufacturers evidently think so. They have entered the race to break the sub-four-inch barrier and capture the first-place trophy of the incredible shrinking floppy.

By Ken Barbier

It's been a long time since a miler broke the four-minute barrier for the first time. More recently, Mylar broke the four-inch barrier with a micro floppy disk. The incentive for the miler was obvious, but it's not so clear as to why we need smaller floppy disks.

Advertising hype for micro floppies keeps mentioning that they're "small enough to fit into a shirt pocket." About the last thing I'll ever want in my shirt pocket is a floppy disk full of valuable data. And while Dolly Parton may be able to fit 5¼-inch floppies into *her* shirt pocket, most of us can't, so dozens of manufacturers have been racing to be first to market a "standard" pocket-sized micro floppy disk.

The sub-four-inch race is on.

Maxell Corp.'s three-inch compact floppy is compatible with and has the same recording capacity as the 5¼-inch, double-denisty mini floppy disk. The new disk's high-density magnetic coating has a hardened plastic center for improved reliability.

Already Out of the Race?

Some of the new smaller disks were never seriously intended to become computer industry standards, and others are obviously not really in the running because of technical reasons.

Besides being used for general-purpose computers, micro floppies are valuable for smart typewriters and other office machines that have a need for limited and low-cost storage. Tiny disks have been developed for this type of dedicated application, but they don't have the speed or capacity for heavy-duty use on computers, so they were never really in the race.

Among the noncontenders is the Tec America two-inch floppy with a single spiral track (read like a phono record) that stores only 16K. Another tiny-capacity disk, produced by Canon, is limited to 40K.

By severely limiting capacity on disks, manufacturers of drives have bought themselves relief from having

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to mass-produce accurate disk-centering and head-positioning hardware.

The track-to-track spacing on these disks is much wider than on the other sub-fours, so the read/write heads and the head-positioning mechanisms can be much less precise. Plastic parts can replace machined metal in the drives, and the disk material itself can be produced with less demanding requirements for temperature stability and freedom from size changes due to differences in humidity.

Even IBM has come up with a format that may never see much application—even though it stores a respectable 250K on a disk about the same size as Canon's (close to four inches in diameter). While this disk is much larger than the three- and 3½-inch disks, it also has more relaxed positioning requirements, since its track-to-track spacing is a moderate 68 tracks per inch (tpi).

This is not much denser than the original 48 tpi found on the first eight-inch and 5¼-inch floppy disks, but it's relaxed enough to permit IBM to use a unique plastic spiral cam for head-positioning, reducing drive manufacturing costs. How this cam will hold up after more use remains to be seen. Of course, if this drive and disk configuration doesn't catch on, we may never see it.

It's easy to write off this funny disk configuration on technical grounds. The disk is almost as big as a 5¼-inch floppy, but it holds less data than the smaller competitors. It would seem to be the worst choice for any manufacturer of a new system looking for a small floppy format. But it's not so easy to write off the power of the name IBM.

With few system manufacturers committed to any of the sub-fours as of this writing, and few drive manufacturers prepared to supply large quantities at this point, an opportunity exists for a manufacturer with financial clout and a high manufacturing capacity to step in quickly and wrest victory from seeming defeat. IBM could do this with instant mass production of low-cost drives, and come from way behind to quickly pass suppliers who are running a more conservative race. Since the IBM micro floppy does not have the most desirable format, end users would suffer from that kind of victory.

Disk Size	3-inch	3¼-inch	3½-inch ANSI	3½-inch Sony
Media envelope	hard	soft	hard	hard
Tracks/side	40	80	80	70
Rotation (rpm)	300	300	300	600
Transfer rate (Kbits/second)	125*/250	250	125*/250	250*/500
Capacity/side (K)	125*/250	500	250*/500	218*/437
Sides	2	1	1	1
Capacity/disk (K)	250*/500	500	500	218*/437
Manufacturers (drives and/or media)	Hitachi Matsushita Maxell MPI	BASF Brown Disk Dysan Seagate Tabor	Athana Brown Disk BASF Memorex Mitsubishi Shugart Sony Tandon Verbatim	Mitsubishi Sony
Manufacturers (systems)	Amdek Gavilan	Soroc		Hewlett-Packard

*Single density

Table 1. Major contenders in the sub-four-inch floppy race. While other micro floppy disks are in the works or already in production, only those with a good chance of becoming computer industry standards are included in this listing. The manufacturers of disk drives, media or systems that have announced support for the various contenders as of June 1983 are listed.

Four Sub-Four Front-Runners

Out in front of the race are the four serious contenders—one in the familiar thin floppy disk envelope and three that incorporate a hard-shell plastic package, which will be something of a new experience for current floppy disk users.

The new stiff plastic disk "envelopes" are intended to provide much better protection to the delicate media than existing envelopes do. When the disk is removed from its drive, a sliding shutter will close off the read/write head access opening in the rigid housing.

Even with this added protection, it's not a good idea to stuff the disk into a shirt pocket; lint, ball-point pens and even tobacco particles could cause damage. And, in case you're a little absent-minded, the disk enclosure won't survive a trip through the washing machine.

Storage

As Table 1 shows, the smallest-capacity micro floppy of the four leaders stores 218K single-density, while the probable winners of the race provide a half-megabyte of data on each tiny disk. That's about the amount of data stored in a 300-page book, so users of the new disks will be way ahead of the first users of the old eight-inch and 5¼-inch floppies, which originally stored only 256K and 72K, respectively.

Older sizes have been upgraded to more than a megabyte of storage per disk by double-density recording techniques, so it's safe to assume at this point that all of the new sub-fours will be delivered for use with double-density controllers, since these controllers now are integrated onto a single inexpensive silicon chip. So we have a choice between a half-megabyte or 437K—essentially the same thing.

The Race: Over Already?

Sony was the early front-runner in the micro floppy race, with the format shown in the last column of Table 1. Since then, a floppy disk industry-standards committee has come up with a slight modification of the first Sony format, shown in Table 1 as the ANSI 3½-inch micro floppy.

Since the modifications to the first Sony format are acceptable to Sony, as can be seen from its inclusion in the list of manufacturers that support the ANSI format, it's safe to assume that the original Sony micro floppy has fallen out of first place contention, if not out of the race altogether.

Lack of the most powerful industry support in this country may also hurt the chances of the three-inch entry (column 1 of Table 1), although it was one of the first to appear in a product delivered to end users. Since this disk requires two heads to provide the half-megabyte of storage that seems to be the established goal, drive production costs will be higher for this one.

That leaves two front-runners—one in the familiar thin but vulnerable

package and one in the protective hard shell. Both provide the same double-density storage, but the hard package will require more storage space on your desk or bookshelf. This can be a consideration for users who expect to have a lot of disks readily available and within reach. The soft package might be more practical for that type of user, and the disks themselves will cost less to produce.

Who Needs Hard Shells?

Why are there two different packaging methods for micro floppies? The hard shell, with its protective shutter, has been deemed by experts to be necessary for disks that have the high-density recording that is common to all of the half-megabyte formats. Others, including the manufacturers of the 3¼-inch disks and drives, don't agree. It seems reasonable that current disk users may be split in their opinions as well.

Users who have no complaints about the reliability of double-sided and/or double-density 5¼-inch or eight-inch floppies probably won't see any reason to select a hard-shell micro floppy. Others may have complaints about reliability, because they haven't treated their disks and drives as the precision mechanisms that they are. It's hard to imagine that a little extra plastic will protect the new media from the careless user, who mixes data with spilled coffee and tobacco ashes.

Other Hardware Features

While the hard shell may or may not be necessary, another mechanical feature of the new disks is a tremendous improvement over earlier floppy disks. That feature is the use of metal hubs bonded to the center of the Mylar disks. This hub provides better protection for disks that frequently are removed and replaced in drives, and also permits the drive to center the disk more accurately.

Most of the sub-fours have track spacing of 135 tracks per inch. That's crowding things! The 96 tpi double track density (80-track) 5¼-inch disk pushed the limits of the thermal and hydroscopic stability of the Mylar media and the drives themselves. The smaller disks make pushing track density to 135 tpi possible because a smaller sheet of Mylar will show less expansion with temperature or absorbed moisture than a large sheet would.

Better media stability would not allow such high track densities without an improvement in disk centering. The new micro floppies' thin metal hubs are designed to permit centering accuracies five to ten times better than is possible with larger disks. This makes the tracks more concentric, permitting higher densities without the need for exotic track-following servos.

Sony's 3½-inch micro floppy disk offers 437.5K of memory capacity on one side of the disk—two times that of the 5¼-inch disk. The rigid protective disk shell cuts down on friction between moving disk and stationary envelope, and its sliding metal guard closes over the exposed portion of the disk to keep out dust, dirt and fingerprints.

A Dead Heat?

Portable machines, whether for computing, dictation, typing, industrial control or yet undreamed-of uses, need the hard shell protective package for their random access mass storage devices. Plug-in cartridges full of megabytes of bubble memory storage were supposed to have captured this market. But bubble memory never lived up to its expectations, due to the high cost of production. Bubbles were supposed to have killed the floppy disk years ago, but the body count seems to have been exaggerated.

This is one race that probably will not have a single first place winner. The familiar thin disk envelope is most convenient for use in an office environment where computers will not be changed a lot and will need dozens of disks readily on-line.

Portable computers and machines that are used in the field or in other hostile environments need all the media protection they can get. So don't be surprised to find two new "standard" disks appearing in at least limited volume this year—the hard ANSI and the soft 3¼-inch.

Who Will Buy Them?

Now that the prediction of the outcome of the race has been cast (or at least typeset) in concrete, it's here for all to see. Whoever reads this can sit back and wait to laugh at the predictor if the race has some other winner. And we can also sit back and wait for the flood of micro floppies to start. We probably won't be buying any ourselves, though.

Before the sub-four drives and media can become mass-production items, and therefore cost-competitive with the 5¼-inch floppy, there will have to be some high-volume manufacturers of computer systems using them.

These manufacturers will have to spin off the development of controller boards for the popular computer buses, and controller ICs for the new disk formats, before individual users will be able to put together a micro floppy subsystem.

There were 5¼-inch Winchester hard disk drives going begging on the market for over a year before the development of inexpensive disk controller boards and chips permitted their wide use. The combination of drive *and controller* availability brought about the mini-Winch explosion.

Before the sub-four micro floppies wipe out the market for their larger predecessors, there will have to be ready availability of drives, and controllers, *and media*. That may take a couple of years. Meanwhile, we have more than enough choices in mass storage devices for all but the tiniest portable computers.

Cute, But . . .

The sub-four race may be interesting, but is the goal worth the effort being spent? The little ones may be cute, but who needs them? As Table 1 shows, it wasn't easy to find *manufacturers* of computer systems who have come out with an endorsement of any of the sub-fours (as of this writing).

For every announced user of micro floppy disks there are a dozen announcements for new small portable computers using 5¼-inch floppy disks. This may change over the next year or two, but there isn't much of a chance for a revolution. A mini floppy disk may not fit into my shirt pocket or yours, but neither of us is about to rush out and demand that someone sell us a floppy that will.■

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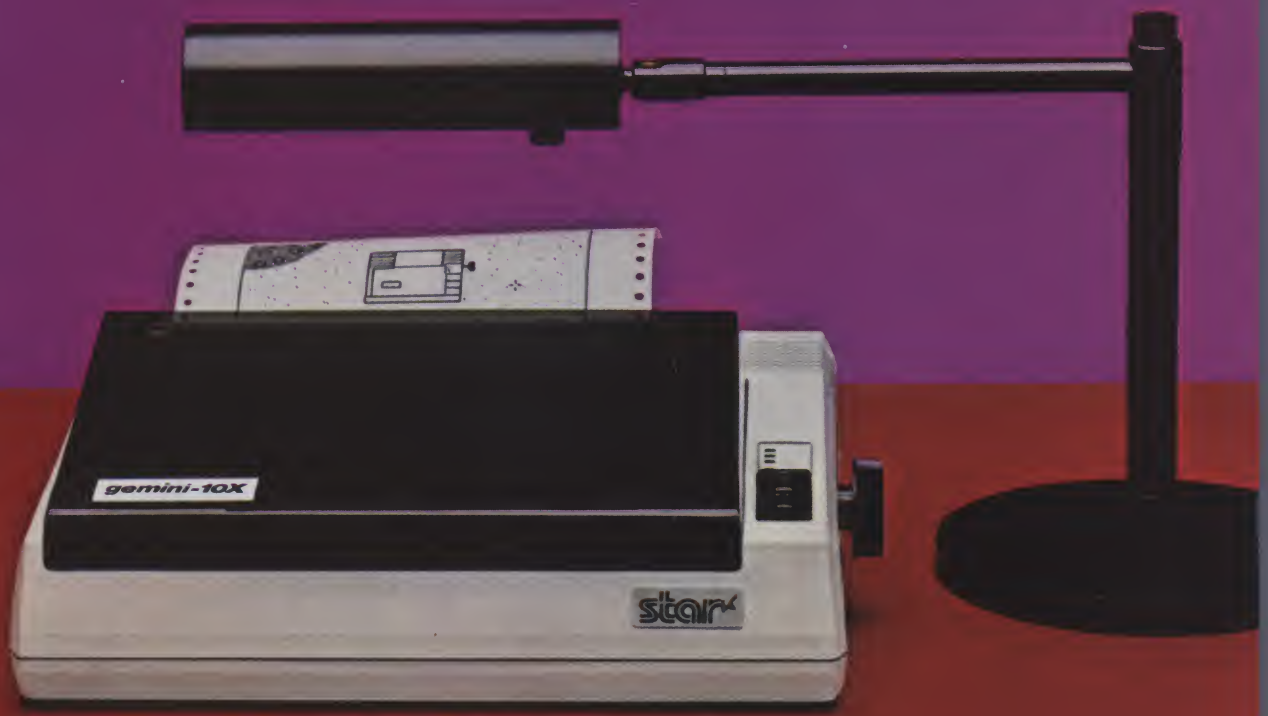

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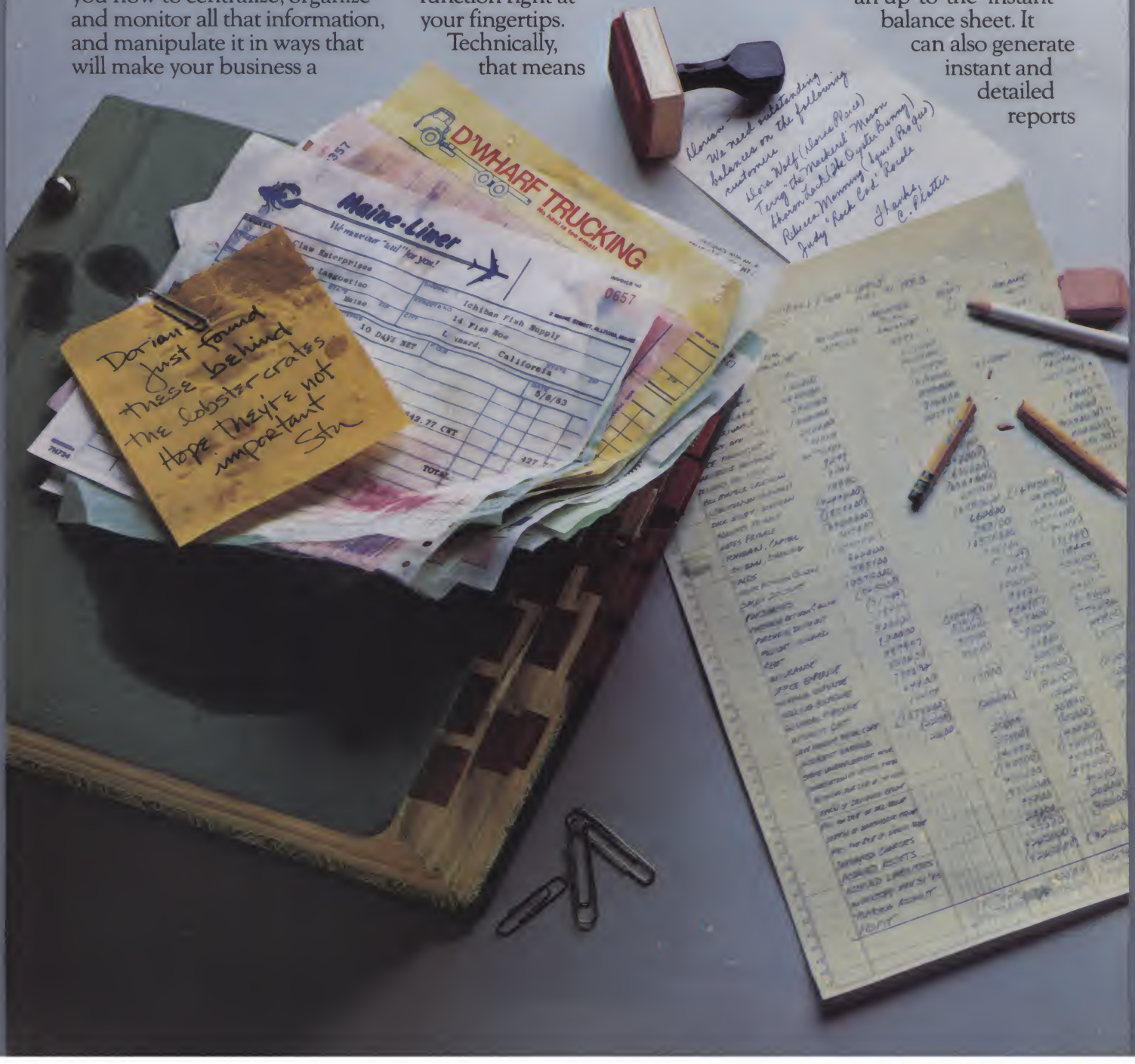

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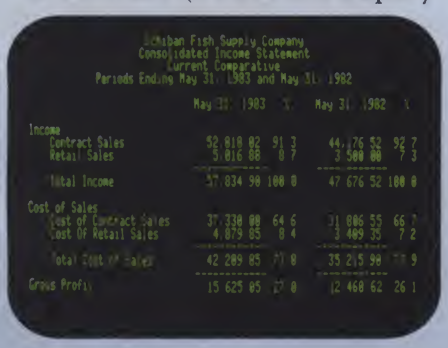

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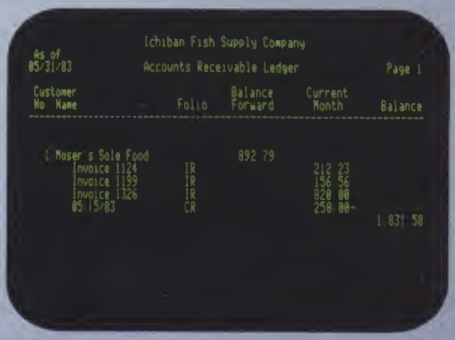

To avoid fishy transactions, you can instantly display customer's payments, charges and current balance. In this case, a few more cans of tuna would put Mr. Moser over his $2,000 limit.

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Circle 193 on Reader Service card.

The Tiny Titan

The new Hyperion portable microcomputer is a stylish and functionally sound clone of the IBM PC.

By Jim Hansen

Does a small semiclone to the IBM PC interest you? If so, you may want to take a close look at the Hyperion, a portable IBM PC-compatible computer system built in Canada by Dynalogic Corp. and available in the United States through many retail computer outlets.

The Hyperion is attractively cased in an off-white solid resin cover, and is small and light enough (21 pounds) to be taken on a plane as carry-on luggage. Running on the Intel 8088 processor, it includes built-in serial RS-232C and Centronics parallel printer interfaces. An internal 300-baud modem (auto-answer, autodial) for direct connection to the telephone network is optional. Although the Hyperion is portable, this means only that it is easily moved about; it is not battery-powered.

Two disk drives, each with a capacity of 320K, and a battery-backed calendar-clock are also standard. The keyboard, physically smaller than that of the IBM PC, has the same complement of keys, but with an improved layout. It is stored in a slot under the screen and disk drives when not in use or when the computer is being moved. A coiled cable allows you to use the detachable keyboard up to four feet from the computer.

The Hyperion's cost ($4555) includes Microsoft's MS-DOS, Multiplan, Advanced Disk Basic Interpreter, a system text editor (In:scribe), a telecommunications manager (In:touch) and the internal direct-connect modem. (Both In:scribe and In:touch were written by Dynalogic especially for the Hyperion.) The system is also available at $3195 without the modem and some of the software.

Externally, the Hyperion is IBM PC-compatible. All I/O connectors are the same, pin for pin. The disk format is also the same, allowing PC disks to be interchanged. Internally, although there are some technical differences, the Hyperion is standard with 256K of memory. All system calls routed through MS-DOS are functionally compatible with those on the IBM PC.

The only currently available internal option is the modem card. There are no internal expansion slots, although the 8088 bus is available at the back apron for connection to a Winchester disk system to be offered later this year.

The Keyboard

The keyboard, thank goodness, is not a copy of the PC's. Although it has the same complement of keys, they are arranged in a more standard pattern. The ten soft keys are spread across the top left of the typing section and directly correspond to the function menu maintained at the bottom of the screen. The shift keys are in the right place for normal typing.

The rub-out key, used for backspace/erase, is located just above the return key, in the spot typically held by the linefeed key on ASCII keyboards. I initially tended to hit the number-lock key located just above the rub-out key, when backspacing.

The Hyperion portable computer shown with software and official 8088 flower.

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But this was a minor nuisance, and I quickly adjusted to it.

The keyboard uses capacitive switches, and people who like a "light" keyboard will probably find this one too springy or cushiony, while those who prefer more spring behind the keys, or who pound keyboards, will be satisfied.

The keyboard is managed by its own 8049 microprocessor and has a built-in 16-character buffer. Data from the keyboard is transmitted serially to the computer. The keyboard can be used flat on a table top, or two internal legs can be used to lift the back of it for a more normal typing angle.

The keyboard assembly is exceptionally light, so it may tend to "walk" during use on a smooth, hard surface. The internal keyboard storage shelf in the computer is convenient, allowing the keyboard to be quickly tucked away or pulled out for use.

The Screen

The screen color is officially called amber. I found that it looked yellow if the room was lit with incandescent lights, and orange with fluorescent. In any case, the contrast is excellent, and the display sharp and steady.

The screen measures seven inches on the diagonal, compared to five on the Osborne 1, thus providing larger characters. The brightness and contrast controls are conveniently located on the right front panel, above the illuminated power switch. (This is one of the few computers whose power switch is where you can easily find it.)

The monitor module is made by Phillips; the CRT is from Japan. A video output jack on the back apron provides composite video for external monitors.

The display as seen on my 12-inch Ball Brothers monitor was clear and free of flicker, "twinkling" or any other kind of interference. As seen on a larger monitor, there is a clear separation of horizontal rows of dots, and the characters look very "dot-matrixish." (This effect, not visible on the Hyperion screen, is the result of deliberately spreading the dots to make characters taller on the smaller screen.)

The external video output is monochrome (black and white). The character cell size is eight by ten dots; characters are designed six dots high by seven wide, with two dot descenders. Graphics resolutions are 640×250 or 320×250, with four levels of gray scale. (The Hyperion also offers 640×200 and 320×200 resolution modes for IBM PC-compatibility.)

Other screen attributes include underline, blink, intensify, reverse, video, double size and super/subscripting, all selectable on a character-by-character basis. About 20K of memory is reserved for the video display.

The Disk Drives

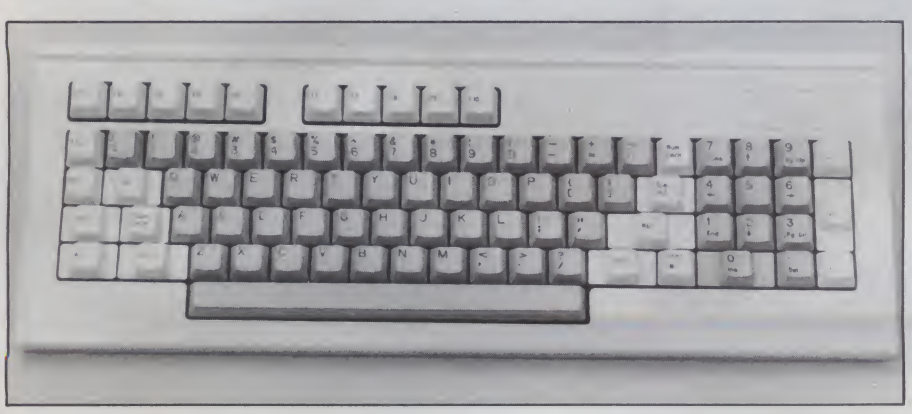
The two double-sided, double-density disk drives are made by REMEX, and are internally housed in a shielded box. A small two-speed fan continuously blows air into this box to help cool them. Normally, the fan is barely audible on low speed, but becomes quite noticeable during disk access times, when it is switched to high. The disk drives themselves make an angry chunk-chunk kind of noise as they switch from track to track. Overall, they sound just a little louder than IBM's, but it's not objectionable.

Dynalogic says it is safe to leave disks in the drives when the computer is turned on or off; in spite of that assurance, I am superstitious and still take them out when I am not using the computer or when I turn it on or off.

The Hyperion can use disks directly from the IBM PC, for full disk and file compatibility. I ran the Hyperion successfully with a DOS from IBM, and had no trouble interchanging files and disks. The only time it did not work was when I called IBM's Basic. This is because Hyperion's Basic is in RAM (it has virtually no ROM except for the power-on diagnostics and disk-boot firmware), while IBM has part of Basic in ROM, and the disk extensions are loaded from disk.

The IBM PC does not work with the Hyperion DOS or Basic, but data files and Basic programs (not Basic itself) ran normally. In:scribe also did not work, because of display memory differences.

So there are cases where it may not be possible to run a program written for IBM or Hyperion on the other machine. This will only occur, however, if the program operates directly on the screen controller, rather than through the operating system, or if the program calls subroutines in IBM's ROM.



The Hyperion keyboard, measuring a scant 16 inches wide by six inches deep.

A Capsule Look At Dynalogic's Hyperion

Manufacturer
Dynalogic Info-Tech Corp., 8 Colonnade Road, Ottawa, Ontario, Canada K2E 7M6; 613-226-1383 or 613-226-7013.

List Price
$4555 (for complete system, including modem).

Standard Features
Intel 8088 16-bit CPU; 256K RAM; two built-in 5¼-inch floppy disk drives, 320K each; 8088 bus connection for future Winchester hard disk systems; standard keyboard (83 keys), managed by its own 8049 microprocessor and with a built-in 16-character buffer; seven-inch (diagonal) CRT with 80-column by 25-line display; built-in serial RS-232C and Centronics parallel printer interfaces; battery-backed calendar-clock; MS-DOS operating system; 115 V ac operation; IBM PC-compatible.

Proportions
Twenty-one pounds; 8.8×18.3×10 inches.

Software
Microsoft's MS-DOS, Multiplan and BasicA; Dynalogic's In:scribe (a system editor) and In:touch (a telecommunications manager); a version of UCSD Pascal will become available.

Options and Accessories
Internal 300-baud modem (auto-answer, autodial); Winchester hard disk system.

Documentation
Set-up guide and three manuals describing the operating system and other software.

The Hyperion Electronics

The computer's electronics is contained on two printed circuit boards sandwiched about an inch apart. They are located along the rear apron of the computer and together form a "chimney," which efficiently cools the two boards through ventilation slots in the top rear of the case. (The slots are adequately screened to prevent things from falling into the computer.)

All internal I/O connections (including the keyboard) are mounted directly on the circuit boards. The only cables inside the Hyperion connect to the CRT, the disk drives and the power supply, which is located between the CRT and the disk drives.

The power supply is of the switching-mode type, minimizing weight and heat inside the cabinet. The Hyperion runs only barely warm to the touch. The ac cord is detachable and must be removed when the computer is packed in its carrying case. The on-off switch, mentioned earlier, is on the front panel and lights up during use, reassuring you that your system is alive.

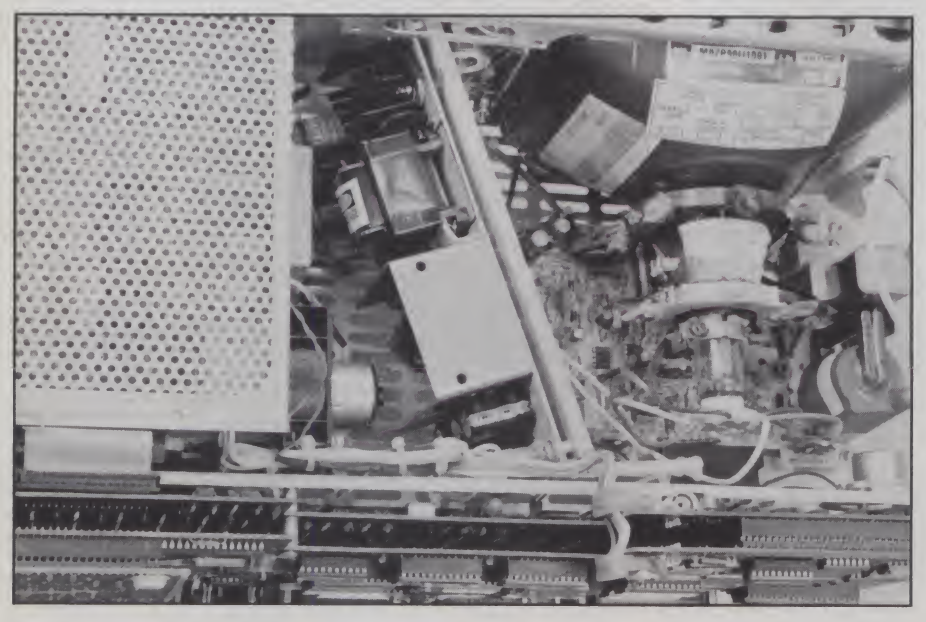
The Software

Besides the standard Microsoft offerings mentioned earlier, a version of UCSD Pascal soon will be available. The two programs Dynalogic already has released, In:scribe (the system editor) and In:touch (the telecommunications manager), merit description.

Both In:scribe and In:touch were written in C, and consume a large amount of memory. Both make extensive use of the soft keys and function menu displayed at the bottom of the screen. In fact, neither is functional without them. The arrangement of the soft keys across the top of the keyboard, in direct physical alignment with the menu blocks, is much easier to use than the two vertical columns found on the IBM keyboard.

In:scribe is the "what you see is what you get" type of editor, and it should be noted that it is not a text processor. The only printing programs provided with the Hyperion are the DOS Type and Copy programs that can simply print files directly from the disk without further formatting. In:scribe does have a provision to allow control codes to be embedded into text files, providing some degree of printer control.

I enjoyed learning to use In:scribe because it is considerably different from other editors I have used. A total of nine different menus, some of them accessed only through as many as two previous ones, control editing operations. This was a little confounding at first, because I knew what I wanted to do, but couldn't find the menu command that I thought would be appropriate. (Naturally, the manual is the slow way of learning anything new, right?)



A top view of the Hyperion's interior. On the right is the CRT monitor. The power supply is in the center, with the disk drive compartment to its left. Notice how the main circuit boards (bottom of photo) are mounted to create a "chimney" for cooling air flow.

Circle 131 on Reader Service card.

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An example of my confusion occurred when I first wanted to change the margins. As it turned out, margins are accessed through the set-up menu, which in turn gives a Tabs? menu, but Tabs? gives control over both the tabs *and* margins. As an experienced computerist, I found myself "fighting" the menus. However, once you get used to it, this editor is convenient. New computerists will probably find it easy and fun to use.

In:scribe is a capable but not fancy editor. It can move blocks of text around, justify and insert text and all of that, but in terms of robustness, it isn't very. I wrote some text (part of this review) on the Hyperion, single-spaced. The only way to make it print double-spaced is to insert an extra line-feed manually on every line. Users of the Hyperion still will need to buy a good text processor.

Combined with the modem and Hyperion, In:touch provides exceptional telecommunications capability. It is also menu-driven, and connection to phone lines is easy. Just plug the modular jack from your phone into the back of the Hyperion, or plug the phone cable provided with the modem into your phone and the Hyperion, and the installation is complete. The phone still can be used normally, but if you are lazy, the Hyperion can dial all of your numbers for you. And, at the touch of a button, it can time your calls, so you can watch the money running from your pocket into Ma Bell's as you talk.

In:touch can maintain a computerized telephone directory as large as a disk. Any number in the directory can be located and automatically dialed with about half-a-dozen keystrokes. (They also can be dialed directly from the keyboard.) A loudspeaker inside the Hyperion monitors the call (you can only hear, not talk) until a connection is made, at which time the computers will start to talk—or you should pick up the phone and talk yourself.

In:touch can automatically transfer files and do all the normal electronic mail things, but the profusion of the menus and options cannot be adequately described in a limited review. Let it simply be said that they are well-done. I was impressed and had a ball playing with the phone.

Perhaps the most exciting software feature (quietly buried in the manuals) is an automatic, internal RAM-disk system. The RAM-disk is a software program that controls part of the 256K of memory. Data from a disk can be read into this memory area, then treated by the operating system exactly as though it were still on the disk, but at memory speeds instead of at disk speeds. (In fact, the operating system doesn't even know this is going on.)

The net result is an incredible increase in speed for operations that normally would be disk-bound. It is all automatic, done for you at no extra cost in either hardware or software. The RAM-disk is referred to as drive "C:" and can be changed to almost any size to optimize memory and disk use. It is set to use 90K when the system is initialized.

Such RAM-disks have been available for S-100-based systems and other computers for some time. They are usually large memory cards (up to about 512K in most cases) and come with system software to control the disk copies in and out of them, and to modify disk calls so that the RAM-disk memory is used instead of the physical disk. What is new in the Hyperion is that the RAM-disk is incorporated as a basic part of the computer system, and no new hardware or software need be added to employ it.

Documentation

Dynalogic supplies four manuals with the Hyperion. The Set-up Guide is a small wire-bound short-form manual intended to help get the computer running and later to serve as a short reference manual. Three major manuals bound in IBM-like binders describe the operation of MS-DOS, In:scribe, In:touch, BasicA, the Macro Assembler and Systems Programming Tools, and Multiplan.

Since they are relatively new, these manuals are still under revision. I found them to be usually accurate, but specific information must occasionally be extracted with tooth and tong. They appear to be complete, at least in the In:touch and In:scribe sections, where I spent most of my time, but they are organized more like what engineers call a "functional specification," a formal document—typically not easy reading—that establishes how a particular piece of equipment or a software package is to operate.

Although not nearly as intimidating as a real functional specification, the Hyperion manuals are not overly user-friendly.

The Verdict

The Hyperion is a complete and quality piece of computing equipment. My one serious reservation is not about the computer itself or its software, but about the documentation. The complaint here is not so much how the information is presented in the manuals, but the difficulty in finding it. Hopefully, this problem will be addressed as the manuals are revised.

As to the system itself, the combination of style, portability and performance, not to mention IBM compatibility, promises to make the Hyperion a successful product.

If you need a portable computer, don't buy anything until you have looked at the Hyperion. And if you need a portable, but can't afford it, *don't* look at this one. . . you may spend the next week gnashing your teeth at night like I did. ■

Foreclosure on the Hyperion. The author loaned the Hyperion to friends at a nearby bank for a week of actual use. The president, although slightly reluctant, gracefully returned the computer to the author's assistant as shown in this actual photo of the event.

Discover the Secret Of VIC's Inner Structure

This valuable machine-language programming tool is the key to examining the ROM routines internal to the VIC-20.

By Thomas Henry

Listing 1. The VIC-20 Machine-Language Tool.

```
10 REM ****************************************
11 REM *                                      *
12 REM *   VIC-20 MACHINE LANGUAGE TOOL       *
13 REM *                                      *
14 REM *          THOMAS HENRY                *
15 REM *      TRANSONIC LABORATORIES          *
16 REM *         249 NORTON STREET            *
17 REM *         MANKATO, MN 56001            *
18 REM *                                      *
19 REM *                                      *
20 REM *                                      *
21 REM *                                      *
22 REM *                                      *
23 REM ****************************************
24 REM
25 REM
30 REM ****************************************
31 REM *                                      *
32 REM *       LISTING CONVENTIONS            *
33 REM *                                      *
34 REM *       CLEAR SCREEN [CLEAR]           *
35 REM *       HOME CURSOR  [HOME]            *
36 REM *       CURSOR UP    [UP]              *
37 REM *       CURSOR DOWN  [DOWN]            *
38 REM *       CURSOR LEFT  [LEFT]            *
39 REM *       CURSOR RIGHT [RIGHT]           *
40 REM *       REVERSE ON   [RVS]             *
41 REM *       REVERSE OFF  [OFF]             *
42 REM *       BLUE CURSOR  [BLUE]            *
43 REM *       RED CURSOR   [RED]             *
44 REM *                                      *
45 REM * WHENEVER YOU SEE THESE BRACKETED     *
46 REM * SYMBOLS, TYPE THE CORRESPONDING      *
47 REM *  CURSOR CONTROL KEY.  A NUMBER       *
48 REM *  WITHIN THE BRACKETS MEANS YOU       *
49 REM *  SHOULD TYPE THE KEY THAT NUMBER     *
50 REM *       OF TIMES IN A ROW.             *
51 REM ****************************************
52 REM
53 REM
100 DIMB$(15),A$(7):POKE36879,220:GOTO700
105 REM
106 REM
107 REM *** CONVERT DECIMAL TO HEX ***
108 REM
109 REM
110 D$="":G=1
120 I=INT(D/16):J=D-16*I:D$=CHR$(J+48-7*(J>9))+D$
130 G=G+1:D=I:IFG<BTHEN120
140 RETURN
145 REM
146 REM
147 REM *** CONVERT HEX TO DECIMAL NUMBER ***
148 REM
149 REM
150 E=0:I=0:IFLEN(E$)<>4THEN210
160 J=ASC(MID$(E$,4-I,1))-48
170 IFJ<0ORJ>22THEN210
180 IFJ>9ANDJ<17THEN210
190 E=E+(16^I)*(J+7*(J>9)):I=I+1:IFI<>4THEN160
200 RETURN
210 PRINT"[9 LEFT] ERROR  ":I=0:GOTO200
215 REM
```

More

The Commodore VIC-20 computer is great for programming animation, thanks to its superb sound, color and graphics capabilities. These features all can be used in Basic, the resident language of the VIC-20. But for greater speed, it is better to carry out animation and other important applications in machine language.

This presents something of a problem to the home programmer, since the VIC-20 has no internal machine-language monitor. To further compound the problem, good documentation on the internal structure of the VIC-20 and detailed descriptions of the ROM routines are hard to come by.

The program presented here is a machine-language tool which will generate hex dumps, ASCII dumps and disassemblies; it also provides several other important machine-language programming functions. With this program, the user can examine the ROM routines internal to the VIC-20 and thus gain first-hand knowledge of the machine's structure. In a sense, the user is writing his own documentation!

About the Program

Examine Listing 1 to become familiar with the structure of the VIC-20 Machine-Language Tool. The program has been heavily documented with REM statements; consequently, little needs to be said about any particular section.

Lines 110–140 form a decimal-to-hex conversion routine. Many parts of the program make use of this routine—primarily because the Peek

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Utility program to transfer OSI CP/M format disk to IBM 3740 single density format. Will also transfer IBM to OSI format.

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You supply software on 8" diskette D&N will transfer OSI CP/M format to IBM 3740 CP/M format. Can also transfer IBM 3740 CP/M format to OSI CP/M format. Original diskette returned.

Circle 293 on Reader Service card.

Listing continued.

```
216 REM
217 REM *** ADDRESS INPUT ROUTINE ***
218 REM
219 REM
220 INPUT"[HOME]START ADDRESS  [RVS]    [OFF][6 LEFT]";E$:GOSUB150:RETURN
225 REM
226 REM
227 REM *** DISASSEMBLY SUBROUTINES FOR DIFFERENT ADDRESSING MODES ***
228 REM
229 REM
230 F=0:RETURN
240 F=1:D=PEEK(P+1):B=3:GOSUB110
250 C$=C$+MID$(A$(0),3*A+1,3)+D$+MID$(A$(0),3*A-5,3)
260 RETURN
270 F=1:D=PEEK(P+1)
280 IFD<128THEND=P+D+2:B=5:GOSUB110:GOTO310
290 D=128-(127ANDD):D=P-D+2:B=5:GOSUB110:D=P-D+2
300 D=P-D+2:C$=C$+" $"+D$:RETURN
310 C$=C$+" $"+D$:RETURN
320 F=2:D=PEEK(P+1)+256*PEEK(P+2):B=5:GOSUB110:RETURN
330 GOSUB320:C$=C$+" $"+D$:RETURN
340 GOSUB320:C$=C$+" $"+D$+",X":RETURN
350 GOSUB320:C$=C$+" $"+D$+",Y":RETURN
360 GOSUB320:C$=C$+" ($"+D$+")":RETURN
365 REM
366 REM
367 REM *** USER DECIMAL TO HEX CONVERSION ***
368 REM
369 REM
370 PRINT"[HOME]                              [HOME]DECIMAL";
380 INPUTD$:D=VAL(D$):B=5
390 IFD<1ORD>65355THENPRINT"[7 LEFT][UP]ERROR":GOTO410
400 GOSUB110:PRINT"[7 LEFT][UP]= $";D$
410 RETURN
415 REM
416 REM
417 REM *** USER HEX TO DECIMAL CONVERSION ***
418 REM
419 REM
420 PRINT"[HOME]                              "
430 INPUT"[HOME]HEX";E$:PRINT"[UP]";:GOSUB150:E$=STR$(E):E=LEN(E$)-1
440 IFI=0THENRETURN
```

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function used in the disassembly and hex dump subroutines yields a decimal result. You enter the subroutine with D equal to the decimal number (between 0 and 65355) and leave it with D$ equal to the hexadecimal equivalent. Note the use of the CHR$ function to generate the proper digits (0–9 and A—F).

The subroutine at lines 150–210 performs the opposite function: a hex number is converted to its decimal equivalent. The routine begins with E$ equal to the four-digit hex number and ends with E equal to the decimal equivalent. In this case, the ASC function is used to derive the proper number.

In addition, some error detection has been worked into the subroutine. If the hex entry contains some non-hex digit, or if it is not exactly four digits long, an error message appears and the user is returned to the main loop.

The one-line routine at 220 simply inputs a hex number. A reverse field, four blocks long, is generated to indicate to the user the desired length of the input number.

Lines 230–360 contain subroutines used by the disassembler. It is the duty of these routines to generate the proper "punctuation" for the operand field (commas, dollar signs, parentheses, etc.). Since the disassembler utilizes standard 6502 mnemonics, a fair amount of work goes into generating the proper punctuation. Note that variable F is either 0, 1 or 2, depending on whether the operand is 0, 1 or 2 bytes long. String A$(0) contains most of the punctuation needed, and the desired parts are stripped off in line 250.

Lines 270–300 convert the relative addresses to absolute addresses by considering whether the branch is backwards or forwards, and whether it's subtracting or adding.

The routine at 370–410 provides the user with a decimal-to-hex conversion. (It's a tedious conversion by hand, so let the computer do it.) The routine essentially inputs a number and then sends it to the subroutine at line 110.

Hex-to-decimal conversion is equally tedious, so lines 420–450 also should be automated. Once again a utility routine (at line 150) is called to perform the task.

Lines 480–540 perform the hex dump and ASCII dump routines. Twenty lines of hex dump are printed on the screen, with four entries to a

line. This implies that the addresses skip by fours, a convenient number to work with in hexadecimal.

All of the memory contents are printed out in hex. In addition, the ASCII equivalents are printed in red at the right of the screen. This is handy when you're looking for messages embedded in code.

The disassembler is included in lines 550–640. Most of the routines used by the disassembler have already been discussed above.

Note, however, that line 600 takes care of the "bad code" case by printing three question marks in a row. Line 630 calls the routine corresponding with the addressing mode currently desired; the routine thus generates the proper punctuation. The variable P keeps track of the current address, while C$ is equal to the mnemonic (e.g., LDA, STX, PLA). Just how the disassembler works will be discussed shortly.

Lines 650–690 comprise the top-level routine. The programmable function keys of the VIC-20 are used to call the various features. For example, the [f1] key starts the disassembly and [f5] starts the hex dump. The function keys generate an ASCII code of 133 to 137 and line numbers 680 and 690 scan for that fact.

Set-up and Tables

The final portion of the program is the set-up and the tables. A string variable array is used to store the needed mnemonics. This type of variable is perhaps a little slower to use than others, but it has the advantage of using relatively little space. This is important, since the stock VIC-20 has only 3.5K of user RAM. Array A$( ) contains the 57 mnemonics, while array B$( ) contains the addressing information.

To see how these arrays generate the proper disassembly, consider an example. Suppose a byte in memory is found to be equal to hex 25. The most significant digit (2 in this case) calls up string B$(2). Now, looking at line 590, the least significant digit (5) is then multiplied by 3 and increased by 1 to yield the number 16. W$ is then set equal to MID$(B$(2),16,3), which is 12C. This code is then keyed to the proper mnemonic (represented by C$ in line 620) by taking the second mnemonic (AND in this example) in string A$(1)—hence the 12 in the 12C string.

The proper addressing mode is found by taking ASC("C"), which is

Listing continued.

```
450 PRINT"[12 LEFT]= #";MID$(E$,2,E):RETURN
455 REM
456 REM
457 REM *** HEX AND ASCII DUMP ROUTINE ***
458 REM
459 REM
460 GOSUB220
470 P=E
480 PRINT"[CLEAR][2 DOWN]";
490 FORZ=1TO20:D=P:B=5:GOSUB110:PRINTD$;
500 FORY=1TO4:PRINT" ";:B=3:D=PEEK(P):GOSUB110:PRINTD$;:P=P+1:NEXT
510 P=P-4:PRINT" [RED]";:FORG=1TO4:D=PEEK(P)
520 IFD<32OR(D>128ANDD<161)THEND=46
530 PRINTCHR$(D);:P=P+1:NEXT
540 POKE212,0:PRINT"[BLUE]":NEXT:RETURN
545 REM
546 REM
547 REM *** DISASSEMBLY ROUTINE ***
548 REM
549 REM
550 GOSUB220
560 P=E
570 PRINT"[CLEAR][2 DOWN]";
580 FORZ=1TO20:D=P:B=5:GOSUB110:P$=D$
590 I=INT(PEEK(P)/16):J=PEEK(P)-I*16:W$=MID$(B$(I),J*3+1,3)
600 IFW$="???"THENC$=W$:F=0:GOTO640
610 I=VAL(LEFT$(W$,1)):J=VAL(MID$(W$,2,1))
620 C$=MID$(A$(I),J*3-2,3):A=ASC(MID$(W$,3,1))-64
630 ONAGOSUB230,240,240,330,270,240,240,340,350,240,240,360
640 PRINTP$+"  "+C$:P=P+1+F:NEXT:RETURN
645 REM
646 REM
647 REM *** TOP LEVEL ROUTINE ***
648 REM
649 REM
650 GETF$:IFF$<>""THEN650
660 PRINT"[HOME]";
670 GETF$:IFF$=""THEN670
680 IFASC(F$)<133ORASC(F$)>138THEN670
690 I=139-ASC(F$):ONIGOSUB370,420,480,460,570,550:GOTO650
695 REM
696 REM
```

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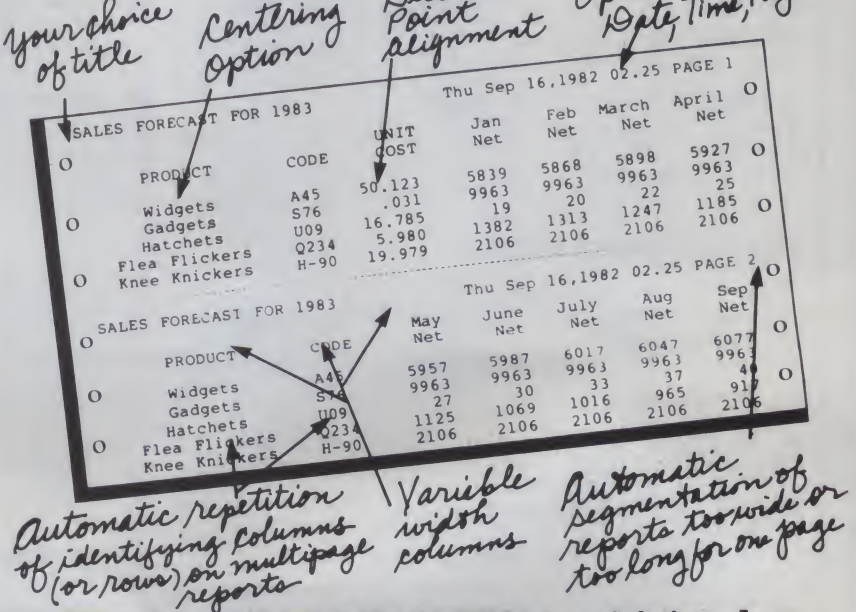

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Listing continued.

```
697 REM *** SET-UP AND TABLES ***
698 REM
699 REM
700 PRINT"[CLEAR][BLUE]":PRINT:PRINT" VIC-20 DISASSEMBLER":PRINT
710 PRINT"   BY THOMAS HENRY"
720 A$(1)="ADCANDASLBCCBCSBEQBITBMI"
730 A$(2)="BNEBPLBRKBVCBVSCLCCLDCLI"
740 A$(3)="CLVCMPCPXCPYDECDEXDEYEOR"
750 A$(4)="INCINXINYJMPJSRLDALDXLDY"
760 A$(5)="LSRNOPORAPHAPHPPLAPLPROL"
770 A$(6)="RORRTIRTSSBCSECSEDSEISTA"
780 A$(7)="STXSTYTAXTAYTSXTXATXSTYA"
790 B$(0)="23A53J??????????53C13C???55A53B13A?????53D13D???"
800 B$(1)="22E53K??????????53F13F???26A53I??????????53H??????"
810 B$(2)="45D12J??????17C12C58C???57A12B58A???17D12D58D???"
820 B$(3)="18E12K??????????12F58F???65A12I??????????12H58H???"
830 B$(4)="62A38J??????????38C51C???54A38B51A???44D38D51D???"
840 B$(5)="24E38K??????????38F51F???28A38I??????????38H51H???"
850 B$(6)="63A11J??????????11C61C???56A11B61A???44L11D61D???"
860 B$(7)="25E11I??????????11F61F???67A11I??????????11H61H???"
870 B$(8)="???68J????????72C68C71C???37A????6A????72D68D71D???"
880 B$(9)="14E68K???????72F68F71F????8A68I77A??????68H??????"
890 B$(10)="48B46J47B???48C46C47C???74A46B73A???48D46D47D???"
900 B$(11)="15E46K??????48F46F47F???31A46I75A???48H46H47I???"
910 B$(12)="34B32J??????34C32C35C???43A32B36A???34D32D35D???"
920 B$(13)="21E32K??????????32F35F???27A32I??????????32H35H???"
930 B$(14)="33B64J??????33C64C41C???42A64B52A???33D64D41D???"
940 A$(0)="[6 OFF] #$[OFF] $[OFF],X[OFF],Y[OFF] $[OFF] $,X)),Y ($ ($"
950 GOTO650
```

67, and subtracting 64, which yields 3. Subroutine 330 is therefore called in line 630, and this routine generates the proper punctuation. The code is zero page addressed in this example.

Although this routine may seem fairly long, in actual practice the program works fairly fast. Disassembling 20 lines takes about six seconds.

Entering the Program

Before typing in Listing 1, note that even though many REM statements are shown, they shouldn't be entered into the computer. The VIC-20's limited memory makes this an impossibility. To make it easier to find the statements which you should enter, notice that the program starts at line 100 and increases by tens. All REM statements are on other numbers. So simply start at 100 and enter all lines which end in a 0.

Cursor controls are used occasionally in Print and Input statements. Since the printer used to generate this listing will not print cursor control symbols (only Commodore printers will do this), another means has to be employed. Bracketed abbreviations are used to indicate cursor controls, and the REMs in lines 31-51 tell how to interpret these.

The program is easy to enter, but be sure to type the spaces exactly as shown in the various Print statements. After entering the program, save it on cassette. And after checking for typing errors and testing the program, make a backup copy.

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Using the Program

Only the function keys, [f1]-[f7], are used to operate the program.

First load and run the program. The title will be displayed and the computer will then wait for your commands:

- [f1]—This key starts the disassembly. After hitting it, you will be asked for a start address. Type in a four-digit hexadecimal number and hit return. The disassembly then will start. If you give an erroneous start address, you'll receive an error message.
- [f3]—This key will continue the disassembly from where you left off. Another 20 lines will be disassembled.
- [f5]—This key starts the hex dump. You will be asked for a start address. Type in a four-digit hex number and hit return; the hex dump then will start. The column on the left will show the address of memory in blue. The next four columns, also in blue, will show the memory contents. The last four columns, in red, will show the ASCII interpretation of the memory contents.
- [f7]—This key continues the hex dump from where you left off.
- [f2]—This key allows you to convert a hex number to a decimal. After hitting [f2] you'll be asked for a hex number. Type in a four-digit number and hit return. The decimal equivalent will be displayed. If you type in an erroneous hex number, an error message will appear.
- [f4]—After hitting this key, which converts a decimal number to hexadecimal form, you will be asked for a decimal number. Type it in and hit return. The hex equivalent will be displayed. Note that the input must be between 0 and 65535 or an error message will be displayed.

To keep memorization to a minimum, a cardboard template can be used to detail the uses of the function keys. Fig. 1 shows such a template. Simply cut out the template and glue it to a piece of cardboard. Then cut out the center area and discard. Finally, seat the template around the function keys.

The VIC-20 Machine-Language Tool should prove to be valuable in making sense of the internal structure of the machine. By using the disassembler, one can interpret routines and see what sort of set-ups are required before entering the routine. The ASCII dump should prove useful in finding Basic keywords in memory as well as error messages.■

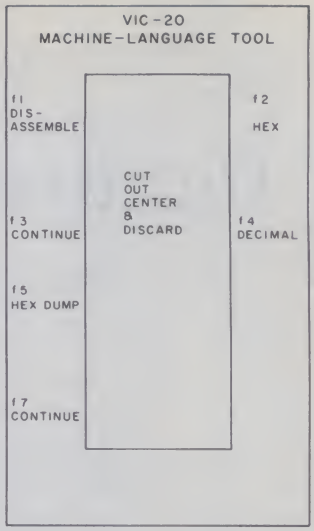

Fig. 1. Function keys cutout template.

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Picture Magic on the VIC-20

This VIC-20 program's memory tricks produce visual treats.

By Roger Hickey

Your Commodore VIC-20 can display some spectacular high-resolution pictures once it is configured for full-screen graphics. Basically, anything that can be represented by a mathematical expression can be plotted on the screen.

In order to understand how the high-resolution graphics capability works on the VIC-20, you must understand how characters are displayed on the screen. The VIC screen is 22 characters wide by 23 characters high. Each of the 506 RAM locations known as "screen memory" contains a number that determines which character is displayed on the screen.

It is important to distinguish these locations from "character memory," where the eight-byte codes for each character are stored. For example, if the first location in screen memory contains the number 1 (the code for the letter A), the VIC-20 goes to the second set of eight bytes in *character* memory to get the data to construct "A" as an 8×8 grid of dots on the screen. Character memory, which normally resides in ROM, therefore requires 506× eight, or 4048, bytes.

The Video Interface Chip (VIC) allows you to change a pointer in memory so that the character memory is stored in RAM instead of ROM. Then, if a location in screen memory contains the number 1, the screen display is still determined by the numbers stored in the second eight bytes of character memory, but the character is no longer an "A."

In fact, since you can change the contents of RAM locations, it is now possible to determine, bit by bit, what appears in this location on the screen. Using all 4048 bytes, it is possible to obtain a screen resolution of 176× 184 (32,384) dots. Any bit set to 1 produces a bright dot on the screen; 0 bits are dark.

The Problem

Since the unexpanded VIC-20 has only 3583 free bytes, the entire character memory and your Basic program obviously won't fit, and full-screen, high-resolution graphics are impossible. The *VIC-20 Programmer's Reference Guide* gives a nice technique for using a 64×64 dot area of the screen for high-resolution graphics.

Unfortunately, it is not trivial to modify that technique to obtain full-screen resolution when you expand your VIC-20 by either 8K or 16K of RAM, because the VIC does not have access to that expansion memory. This means you can't store either screen or character memory in the extra RAM. (This isn't true with a 3K memory expander, because it uses a different part of RAM that *is* accessible to the VIC.)

You can, however, store your Basic program in the expansion memory. The VIC-20 is configured so that when 8K or more of expansion memory is inserted, it occupies addresses beginning at 8192 or successively higher locations. Under this configuration, the User Basic Area normally starts at location 4608. But since you want to reserve this area for character and screen memory, you must move the User Basic Area to the expansion memory.

This requires a couple of pokes to the memory locations that hold the pointer to the start of Basic (locations 43 and 44). Furthermore, the first memory location in the User Area must contain a zero. The following line will do the trick:

```
POKE43,1:POKE44,32:POKE8192,0:NEW
```

NEW will cause all of the other Basic pointers to line up properly.

Note that this line must be typed *before* you enter your Basic program. If you save your program and turn off the computer, you must retype this line before you load the program back into memory. If you forget, the program will load, but the system will crash if you try to run it.

This still leaves a problem. With the memory expansion in place, screen memory normally occupies the 506 memory locations between 4096 and 4601. For full-screen, high-resolution graphics, you want to move character memory to RAM, as explained above, but the only RAM starting locations allowed by the VIC are 4096, 5120, 6144 or 7168.

Since the last accessible RAM location is 8191, the only way to fit all 4K of character memory into RAM is to start at memory location 4096. But this leaves no other VIC-accessible 506-byte block of memory in which to put screen memory.

The Solution

One solution to the problem involves using some of the other capabilities of the powerful VIC. The trick I am about to describe will result in a resolution of 160 dots wide by 176 dots high. This is slighly less than the full-screen resolution of 176×184. Specifically, you will lose the rightmost 16 columns and the bottom eight rows of dots.

Now it is possible to instruct the VIC to use characters each made up of 16 bytes instead of eight, arranged in an 8×16 grid of dots. Under normal conditions, these characters would not be readable. In this case, however, you are concerned not with the characters, but only with the individual

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bits within each character.

The advantage of using 16-byte characters is that you need only half as many to fill the screen. Line 70 of Listing 1 makes this change. Line 60 adjusts the screen to 11 rows instead of the usual 23, since each character is now twice as high. This is where you lose the bottom eight rows of bytes.

Now, if you're willing to give up the last two rows of characters at the right of the screen, you need only 20 characters across by 11 characters down to describe the screen, and screen memory can be compactly stored in 220 bytes instead of 506. Furthermore, character memory will require only 20 bytes for screen width and 11 rows by 16 bytes for screen height, for a total of 3520.

Therefore, if character memory starts at location 4096, it will occupy successive locations up to 7616. This just leaves room to tuck in the screen memory at the page beginning at byte 7680. Lines 10 and 20 of Listing 1 combine to make both of these changes.

To summarize, character memory now starts at location 4096, screen memory at 7680 and the User Basic Area begins at location 8192.

Finishing Details

Only a few other steps remain to complete the initialization process. Line 30 of Listing 1 clears the character memory so no dots are initially turned on. Line 80 colors the screen and border black. Line 40 moves the screen display a little to the right to compensate for the unused columns.

The loops in lines 90–110 map the screen for use with the algorithm in the subroutine at lines 270–320. This was adapted from a similar algorithm described in the *VIC-20 Programmer's Reference Guide*. The mapping process stores successive integers, column by column, in screen memory. As described above, this associates the upper left corner of the screen (where a 0 is stored) with the first 16 bytes of character memory, the second row of the first column (where a 1 is stored) with the next 16 bytes, and so on for all 220 locations in screen memory.

There is now a one-to-one correspondence between every dot on the screen and a bit in character memory. The subroutine, lines 270–320, converts a given pair of coordinates, X and Y (in the correct range), to a particular bit in character memory and pokes a 1 into that bit, thereby making a dot appear on the screen.

Finally, the loops in lines 114–117 poke an unused, but zeroed, character code into the unused portion of the screen. If you fail to do this, an unwanted pattern may appear at the right of the screen. Line 230 of the listing is included to leave the display on the screen when you have completed it.

To stop the program, hold down the Run/Stop and Restore buttons simultaneously. This resets all of the pointers (except the start of User Basic Area) to their normal value and displays Ready on the screen. The graphics image will disappear.

Using the Graphics

Three examples are included here to show possible types of uses of this program. The middle part of Listing 1, lines 150–220, computes successive approximations to a square wave, using a Fourier Series. The program simultaneously displays three different graphs.

At the top of the screen is plotted the result of adding the first four terms of the series. The middle and lower graphs show the results of adding eight and 16 terms, respectively, so each graph is a better approximation of a square wave. This display might have application in an introductory physics or electronics course. The Basic code for this part of the program is quite simple and self-explanatory.

You can replace this section of the program by the code shown in Listing 2. Now the same core program has become an X–Y plotter. The display will show a Lissajous figure, a closed looping curve familiar to anyone who has used an oscilloscope. This program is fun to watch as it creates the figure.

Finally, Listing 3 is a program segment that shows the striking effects that can be achieved with the same core program and a little additional effort. This code again replaces lines 150–220 of Listing 1. The X–Y plotting capability is used here to make a "three-dimensional," or perspective, plot of the bell-shaped Gaussian surface, $Z = A \exp[-k(x^2 + y^2)]$.

There are two things worth mentioning about this section of code. First, the top line of the screen, not the bottom, corresponds to $Y = 0$. Unless line 185 is present, the picture will be

```
 5 REM FOURIER SERIES - SQUARE WAVE APPROXIMATION
 10 POKE36866,PEEK(36866)OR 128:          REM SCREEN AT 7680 (LINES 10 AND 20)
 20 POKE36869,252:POKE648,30:             REM CHARACTERS AT 4096
 30 FORI=4096TO7679:POKEI,0:NEXT:         REM START WITH ALL BLANK CHARACTERS
 40 POKE36864,PEEK(36864)AND128OR7:       REM MOVE SCREEN TO RIGHT
 60 POKE36867,PEEK(36867)AND129OR22:      REM  11 ROWS
 70 POKE36867,PEEK(36867)OR1:             REM  8*16 CHARACTERS
 80 POKE36879,8:PRINTCHR$(147):           REM BLACK SCREEN & BORDER
 85
 90 FORL=0TO19:FORM=0TO10:                REM THESE LOOPS MAP THE SCREEN,
 100 POKE7680+M*22+L,K:K=K+1:             REM (COLUMN BY COLUMN) TO
 110 NEXTM,L:                             REM CHARACTER MEMORY
 112
 114 FORL=20TO21:FORM=0TO12:              REM THESE LOOPS CLEAR THE
 115 POKE7680+M*22+L,221:                 REM UNUSED PORTION OF THE
 117 NEXTM,L:                             REM SCREEN
 130
 140
 150 FORX=0TO159
 155 Y=INT(88+87*SIN(X/10))               REM FIRST TERM IN SERIES
 160 FORM=3TO7 STEP2:                     REM ADD 3 MORE TERMS
 163 Y=Y+INT(88+(87/M)*SIN(M*X/10))
 165 NEXT:Y=Y/5-40:                       REM Y POSITIONS TOP GRAPH
 170 GOSUB270:                            REM PLOT POINT FOR FIRST GRAPH
 175 Y=(Y+40)*5:                          REM RESTORE Y  FOR NEXT CALCULATION
 180 FORM=9TO15 STEP2:                    REM ADD NEXT FOUR TERMS
 184 Y=Y+INT(88+(87/M)*SIN(M*X/10))
 185 NEXT:Y=Y/6-18:                       REM GRAPH IN MIDDLE OF SCREEN
 190 GOSUB270:                            REM PLOT POINT FOR SECOND GRAPH
 191 Y=(Y+18)*6
 192 FORM=17TO31 STEP2:                   REM ADD EIGHT MORE TERMS
 194 Y=Y+INT(88+(87/M)*SIN(M*X/10))
 195 NEXT:Y=Y/8-10:                       REM GRAPH AT BOTTOM OF SCREEN
 199 GOSUB270:                            REM PLOT POINT FOR THIRD GRAPH
 220 NEXT
 221
 222
 230 GOTO230:                             REM KEEP DISPLAY ON SCREEN
 240
 270 CHAR=INT(X/8)*11+INT(Y/16):          REM FIND CHARACTER ON SCREEN
 280 ROW=(Y/16-INT(Y/16))*16:             REM FIND ROW WITHIN THE CHARACTER
 290 BYTE=4096+16*CHAR+ROW:               REM FIND BYTE IN CHARACTER MEMORY
 300 BIT=7-(X-INT(X/8)*8):                REM FIND BIT WITHIN THE BYTE
 310 POKE BYTE,PEEK(BYTE)OR2↑BIT:         REM TURN THAT BIT "ON"
 320 RETURN
READY.
```

Listing 1. Basic program for full-screen, high-resolution graphics. The middle section displays successive approximations to a square wave.

inverted. This didn't matter in the other examples, because of the symmetry of the graphs, but it does here.

The other point is the technique for dealing with hidden lines in the figure on the screen. Since this is a perspective drawing, the "back" of the figure should not be visible, so data points corresponding to that part of the figure must be suppressed.

The simplest way to do that is to keep track of the highest Y-value at every X-location, and never plot a point whose Y-coordinate is lower than the maximum Y for that value of X. Lines 187 and 188 of Listing 3 accomplish this. The variable L keeps track of the fact that the X-axis keeps shifting one dot to the right for each new line in order to give perspective to the drawing.

```
 150 FORK=0TO189STEP.3
 155 X=INT(80+79*SIN(K/15)):  REM AMPLITUDE = 79;  CENTERED BY 80
 160 Y=INT(88+88*SIN(K/10)):  REM SAME EXCEPT 176 COLS IN Y-DIRECTION
 170 GOSUB 270:               REM PLOT THE POINT
 220 NEXT

READY.
```

Listing 2. Basic program segment to display a Lissajous figure. This code replaces lines 150–220 of Listing 1.

```
 145 X0=1:Y0=1:L=0:                        REM X0,Y0 ARE HOR & VERT INCREMENTS
 146 DIMM(200):FORX1=0TO200:M(X1)=175:NEXT
 150 FORK=0TO55:                           REM K IS THE NUMBER OF SLICES
 155 FORX1=0TO100
 160 Y1=K*SQR(X0↑2+Y0↑2):                  REM FOR CONSTANT INCREMENTS ON Y-AXIS
 165 R=(X1-50)↑2+(Y1-50)↑2
 170 Z=100*EXP(-0.003*R):                  REM PEAK AT 100; .003 DETERMINES WIDTH
 180 X=X1+K*X0
 185 Y=Z+K*Y0:Y=175-Y:                     REM Y=0 IS AT THE TOP OF THE SCREEN
 187 IFY>=M(X1+L)THEN220:                  REM CHECK FOR HIDDEN POINTS
 188 IFY<M(X1+L)THENM(X1+L)=Y:             REM KEEP TRACK OF HEIGHT AT EACH X
 190 GOSUB270:                             REM PLOT THE POINT
 220 NEXTX1:L=L+1:NEXTK
READY.
```

Listing 3. Three-dimensional, or perspective, plot of a bell-shaped curve. This code replaces lines 150–220 of Listing 1.

Suggestions for Improvement

The major problem with this program is its lack of speed. It is slow, plotting approximately three points per second. This isn't terribly important for the programs in Listings 1 and 2, but the third example, which plots more than 5000 points, requires about 30 minutes to complete the picture. The Basic code might be speeded up a little by someone clever, but the best solution probably lies in rewriting some or all of the code in assembly language.

It should be possible to label the graphs with numbers or letters, although I haven't tried this yet. The somewhat tedious process would involve poking the eight-byte codes for the desired letters or numbers into the appropriate bytes between locations 4096 and 7616. This should result in some professional displays.■

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The Beleaguered Compaq

This IBM PC compatible has overcome shaky beginnings to establish itself as an elegant little portable.

By Kenniston Lord

"Riding the coattails" of a major computer manufacturer has always been precipitous, at best, but the problems that have been encountered by Compaq Computer Corporation with its IBM-compatible Compaq Portable Computer have not been technical and have not been with IBM.

The product, manufactured by three former Texas Instruments employees, has been plagued by law suits from Texas Instruments, denigration by a major IBM Personal Computer magazine and an overwhelming inability to quickly fill the marketplace with what appears to be a superb product.

On the other side of the coin, *The New York Times* has stated that the Compaq Portable Computer might be the Osborne 1 of 1983, prompting Osborne, it would seem, to reenter the field with an IBM-compatible model of its new Executive, just in time for Comdex, Atlanta. The prior Comdex was also revealing, with industry analyst Dr. Portia Isaacson's pronouncements that the Compaq, and only the Compaq, provided the much-heralded IBM "look-alike" compatibility.

Not much has been heard from the other compatibles—the Colby, the Hyperion and a few others. Compaq must be doing something right. They can't build them fast enough.

The Compaq Portable Computer is a delightful machine to own and use. For the IBM PC owner with a need for a second machine, the Compaq offers a second machine for half to two-thirds the price of the PC, depending upon selected configuration. And it offers an effective alternative for a purchaser who wants to benefit from the wealth of PC-compatible software.

In an industry beset by the lack of intermachine compatibility and system standards, Compaq has provided the first tool that may be integrated to the growing number of PCs and XTs. It's a simple fact—with the exception of the way Basic is implemented, the operation of the machine is identical to the PC's. The Compaq computer is portable, capable and a pleasure to use. And the additional disk storage, double-sided, single density (DSSD), provides capacity not available with the single-sided, single-density (SSSD) drives purchased with the PC. More on the disk drives a bit later.

The Compaq weighs 28 pounds (in its shipped configuration) and is carefully and ruggedly constructed. This system sits upright, not at an angle like some portables. The package is handsome, exuding solidity and strength. Both the system unit's case and the detachable keyboard have swing-down feet. Once the system unit has been set upon those feet, with the bottom of the case facing you, the keyboard may be detached.

The keyboard is a replica of the PC's keyboard, and is connected to the system unit by a six-foot retractable cord. It is held to the package by a pair of nylon slides that move from the bottom of the keyboard case into the computer's main case, on either side. While the size of the slide is certainly sufficient to hold the keyboard in

The Compaq Portable Computer features a nine-inch display, 128K RAM and, most importantly, IBM-PC compatibility.

Address correspondence to Kenniston Lord, 45 School St., Winchendon, MA 01475.

place, extreme care must be taken to ensure that both slides are fully extended before picking up the unit. A longer slide mechanism would provide more security for the keyboard.

The Compaq uses a 16-bit 8088 Intel processor. As delivered, the system provides 128K of RAM; a single 320K disk drive (a second drive is available for $595); a nine-inch monochrome display; standard IBM PC keyboard; interfaces for parallel printers, RGB (red-green-blue) color monitor, composite monitor, and color or black-and-white TV RF Modulator. There is room for the installation of the Intel 8087 coprocessor, if your application is heavily computational. Also an asynchronous communications card is available for $145. There is even a nylon designer carrying case available for $75.

The package includes Compaq's implementation of MS DOS and Basic. In fact, while the IBM DOS will function on the Compaq, the IBM Basic will not. IBM Basic is tripartite, in building blocks. Part of IBM's Basic (Cassette Basic) is ROM-resident. Disk Basic utilizes Cassette Basic. Advanced Basic (BasicA) uses both the Cassette Basic and Disk Basic. In the Compaq, a single disk-resident Basic is used—BasicA. MS DOS and BasicA are both products of Microsoft, Inc.

Tests intermixing disks have provided some interesting results. So far, with the exception of Basic, none of the standard software in use has failed to work on the Compaq. Some have

A Capsule Look at the Compaq Portable Computer

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worked a little differently than expected, but all have functioned.

Documents produced on the PC's SSSD drives can be read on the DSSD of the Compaq. The reverse is not true—a document recorded on a disk formatted on the Compaq will not run on the PC.

Interestingly, if you format a SSSD disk on the PC and then take that disk to the Compaq, documents can be copied onto it. This is true for both word processing (ASCII) documents and binary programs. The disk can then be brought back to the PC and read. This avoids the disruption of printer attachments. On the other hand, a DSSD disk formatted on the Compaq will not receive a word processing document on the PC. Thus, there is a way in which compatibility may be achieved using dissimilar drives.

The arrangement must be carefully thought out, or you're certain to lose a document somewhere. Careful labelling of disks is the key.

Memory additions are available at $195 per 64K. Compaq will handle up to 256K on the main system board. Add-ons which are compatible with the IBM system are also compatible with the Compaq; three expansion ports are available. A second 256K may be added on a second board, bringing the total memory capacity to 512K. Compaq envisions the possibility of users adding a Winchester hard disk, an internal direct-connect modem, and local area communication network interfaces to this machine.

The nine-inch monochrome display is easily viewed and an available panel control lets you change the brightness. There is no ability to change contrast, however, and that may be a serious deficiency for people who rely on that capability.

> All the . . . programs written for the IBM will run on the portable Compaq Computer with no modification whatsoever.

One immediate difficulty was encountered in this regard, when it was observed that the word processing package in use did not change the shading of a block of text when marked. Likewise, the ruler line did not get brighter when temporary adjustments were made to the left margin. On the PC, you learn that this capability is a function of the monitor's contrast control, and while the word processor's feature itself works, the lack of contrast provides uncertainty.

The screen is a high-resolution monochrome screen capable of high-resolution graphics. According to the literature, it "combines the high-quality character font available on the IBM monochrome display adapter and the high-resolution graphics available on the IBM color graphics adapter, all in a manner which maintains total software compatibility. That means the Compaq Portable can display IBM-compatible graphics and high-resolution numbers and text on a single monitor." So, it would seem, Compaq has gone IBM one better. The screen displays 25 lines of 80 characters. Graphics are depicted by a 7×9 dot-matrix configuration within a 9×14 cell.

If you purchase the Compaq in its full configuration (512K, two drives, asynchronous communications card and carrying case), your total expenditure would not exceed $5,000. However, Compaq gives you more than enough to be fully compatible and operational with its minimum of 128K and one drive. While users may be able to live with a single drive, no doubt most of these systems will be sold with dual drives.

Literature for the Compaq claims that it "isn't a portable IBM Personal Computer, but thinks like one. All the impressively useful, popular programs written for the IBM will run on the portable Compaq Computer with no modification whatsoever."

You can understand why they would say that, but while the two machines may not be totally identical, they are close enough to provide intersystem usage. The owner of both systems won't really care what the Compaq is called; he'll be happy to have two compatible systems.

Some might wonder why IBM would permit such a thing to happen. IBM has learned some valuable lessons over the years. One of those lessons is that arguments over similarities weakens everybody's position, and that everybody stands to gain by avoiding them. IBM was a long time learning that lesson, but the evidence is that the company has done it.

Osborne, at least, has decided that perhaps Compaq knew something, and the IBM-compatible Osborne Executive may well become an active challenger to the Compaq, particularly if the original Osborne can be retrofitted with compatibility.

It's doubtful that Compaq Computer Corporation is worried; they are already entrenched and assured of a secure position once the distribution channels are full. The Compaq is scheduled in the ComputerLand chain at about the time you'll be reading this article.

Certainly Compaq Computer Corporation isn't about to assail IBM's dominance in the computer manufacturing business; it's really to IBM's advantage for Compaq to build and sell its computer, because it will provide free market research for "Big Blue" when it finally decides to step into the portable sweepstakes for itself.

For many firms, living under the IBM umbrella has been profitable for years—troublesome to some, but profitable for most.

So to be called an IBM Portable, even by implication, may well provide benefits for all.■

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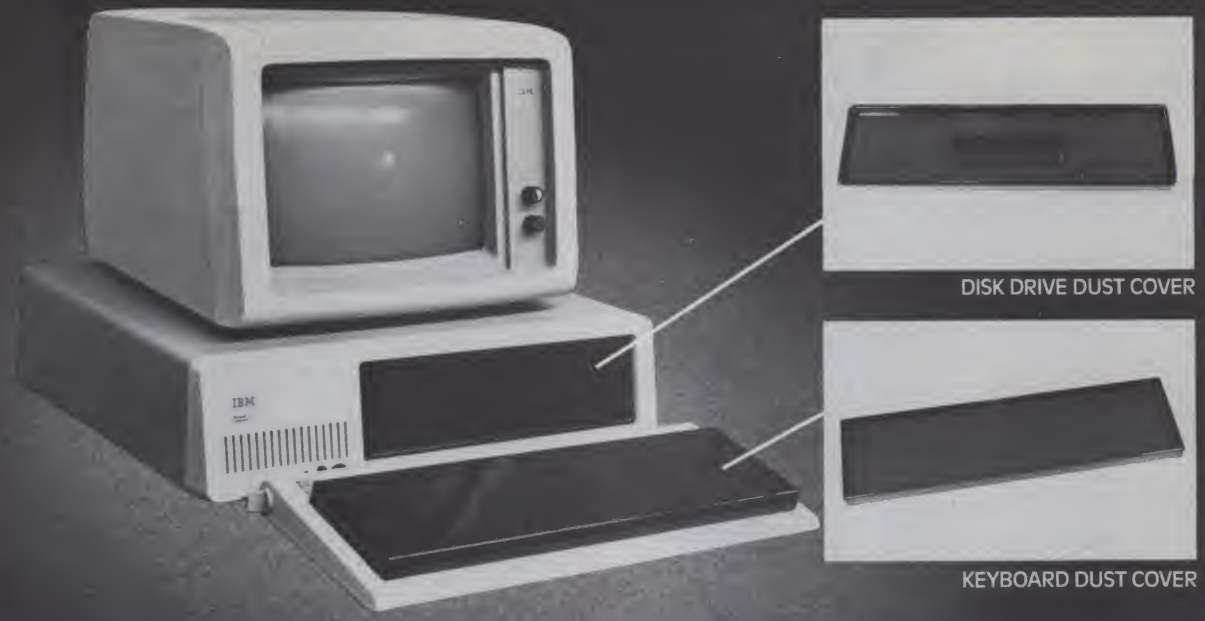

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Scope It with Your Apple

For computerists who occasionally need an oscilloscope, this inexpensive way of measuring analog voltages will pay off. At a cost of about $6 in parts, your homemade 'scope justifies once- or twice-a-year use.

By Scott D. King

Have you ever needed an oscilloscope but couldn't afford to shell out hundreds of dollars? Me too. . . I needed a quick and cheap method of measuring some low-level analog signals, but I simply could not afford to buy even a cheap scope. Add to that the fact that I do analog work only once or twice a year, and I could hardly justify it to myself.

An Alternative

So I had to come up with something else. I had often thought about how nice it would be to use my Apple II as a troubleshooting aid, but I hadn't expected to use it as a piece of test equipment.

The hardest part—and the most expensive part—of using a computer to measure analog voltages is the digital-to-analog converter. Most of the D/A converters I've seen cost almost as much as a complete oscilloscope. So much for the cost effectiveness of that idea.

Then I found an inexpensive D/A converter. I was browsing through a local Radio Shack store when there it was—an LM 3914 bar graph driver, which is a 16-pin IC used to make an LED bar graph display.

Inside the little bugger there are ten differential comparators attached to a string of precision resistors. When set up properly, these comparators will turn on one at a time as the input voltage is increased. Think of it as a large bucket on the floor with a series of holes drilled up one side; as you fill up the bucket, the water spills through the higher holes.

```
0800-  A2 00     LDX  #$00
0802-  18        CLC
0803-  AD 63 C0  LDA  $C063
0806-  29 80     AND  #$80
0808-  6A        ROR
0809-  85 00     STA  $00
080B-  AD 62 C0  LDA  $C062
080E-  29 80     AND  #$80
0810-  05 00     ORA  $00
0812-  6A        ROR
0813-  85 00     STA  $00
0815-  AD 61 C0  LDA  $C061
0818-  29 80     AND  #$80
081A-  05 00     ORA  $00
081C-  9D 00 0A  STA  $0A00,X
081F-  E8        INX
0820-  D0 E0     BNE  $0802
0822-  EA        NOP
0823-  EA        NOP
0824-  EA        NOP
0825-  EA        NOP
0826-  EA        NOP
0827-  EA        NOP
0828-  EA        NOP
0829-  EA        NOP
082A-  EA        NOP
082B-  EA        NOP
```

```
082C-  A2 00     LDX  #$00
082E-  BD 00 0A  LDA  $0A00,X
0831-  18        CLC
0832-  2A        ROL
0833-  2A        ROL
0834-  2A        ROL
0835-  2A        ROL
0836-  9D 00 0A  STA  $0A00,X
0839-  E8        INX
083A-  D0 F2     BNE  $082E
083C-  60        RTS
083D-  AD 63 C0  LDA  $C063
0840-  29 80     AND  #$80
0842-  D0 F9     BNE  $083D
0844-  AD 63 C0  LDA  $C063
0847-  29 80     AND  #$80
0849-  D0 B5     BNE  $0800
084B-  4C 44 08  JMP  $0844
084E-  AD 63 C0  LDA  $C063
0851-  29 80     AND  #$80
0853-  D0 03     BNE  $0858
0855-  4C 4E 08  JMP  $084E
0858-  AD 63 C0  LDA  $C063
085B-  29 80     AND  #$80
085D-  D0 F9     BNE  $0858
085F-  4C 00 08  JMP  $0800
```

Listing 1. Machine-language routine for the Basic "no-frills," high-speed sweep program for the oscilloscope.

```
0800-  A2 00     LDX  #$00
0802-  18        CLC
0803-  AD 61 C0  LDA  $C061
0806-  29 80     AND  #$80
0808-  6A        ROR
0809-  85 00     STA  $00
080B-  AD 62 C0  LDA  $C062
080E-  29 80     AND  #$80
0810-  05 00     ORA  $00
0812-  6A        ROR
0813-  85 00     STA  $00
0815-  AD 63 C0  LDA  $C063
0818-  29 80     AND  #$80
081A-  05 00     ORA  $00
081C-  9D 00 0A  STA  $0A00,X
081F-  A4 01     LDY  $01
0821-  C8        INY
0822-  D0 FD     BNE  $0821
0824-  E8        INX
0825-  D0 DB     BNE  $0802
0827-  EA        NOP
0828-  EA        NOP
0829-  EA        NOP
082A-  EA        NOP
082B-  EA        NOP
082C-  A2 00     LDX  #$00
082E-  BD 00 0A  LDA  $0A00,X
0831-  18        CLC
0832-  2A        ROL
0833-  2A        ROL
0834-  2A        ROL
0835-  2A        ROL
0836-  9D 00 0A  STA  $0A00,X
0839-  E8        INX
083A-  D0 F2     BNE  $082E
083C-  60        RTS
083D-  AD 63 C0  LDA  $C063
0840-  29 80     AND  #$80
0842-  D0 F9     BNE  $083D
0844-  AD 63 C0  LDA  $C063
0847-  29 80     AND  #$80
0849-  D0 B5     BNE  $0800
084B-  4C 44 08  JMP  $0844
084E-  AD 63 C0  LDA  $C063
0851-  29 80     AND  #$80
0853-  D0 03     BNE  $0858
0855-  4C 4E 08  JMP  $084E
0858-  AD 63 C0  LDA  $C063
085B-  29 80     AND  #$80
085D-  D0 F9     BNE  $0858
085F-  4C 00 08  JMP  $0800
```

Listing 1a. Machine-language routine for oscilloscope—with the addition of a variable sweep rate ($81F_H$ through 823_H).

Address correspondence to Scott D. King, 7905 59th Avenue N., New Hope, MN 55428.

Anyway, now that we have this wondrous little D/A converter, what are we going to do with it? We're going to use it to allow the Apple to read analog levels.

The folks at Apple, although they didn't give us a real eight-bit input port, *did* provide us with the game port. And if you're like me, you already have about 20 different things to plug into your game port. Well, here's number 21.

The LM 3914 IC has ten output pins—one for each step of the voltage divider chain. So if the biasing is set up right, you'll end up with one step per volt, or a ten-volt full scale. Or, if your situation requires it, you'll wind up with a one-volt full scale, with one-tenth-volt steps.

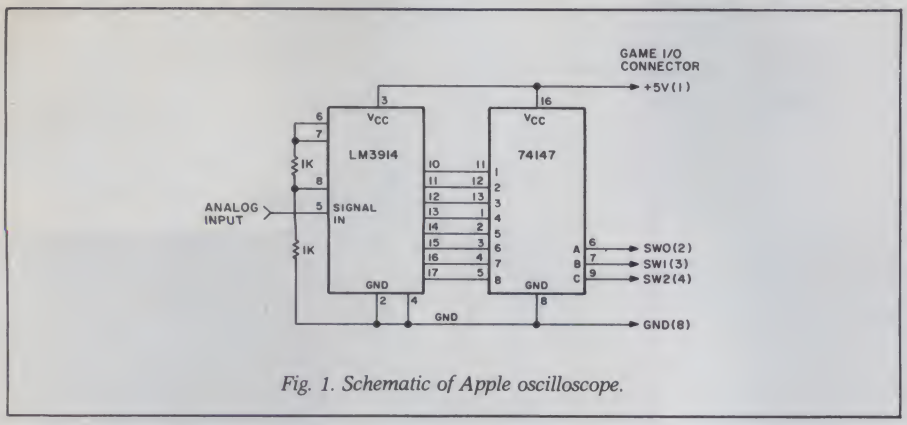

Fig. 1. Schematic of Apple oscilloscope.

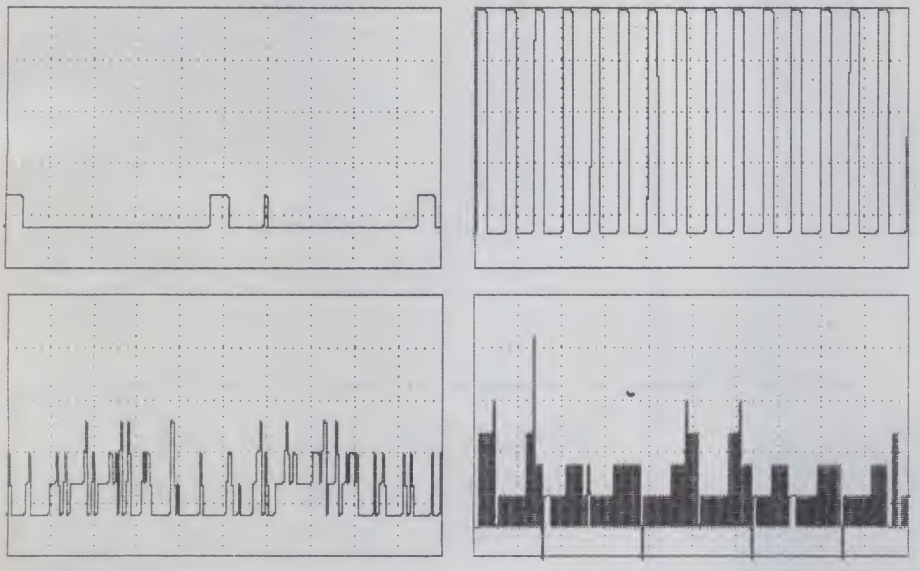

Fig. 2. Random signals from the Apple as it was operating. A hi-res page dump was used to copy these samples from the screen onto an MX-70 printer.

> Now that we have this wondrous little D/A converter, what are we going to do with it?

If you're working with the game port (which provides only three TTL inputs) instead of an eight-bit port, you'll need to reduce the ten steps out of the A/D converter to three bits. By using a 74147 priority encoder, you'll end up with three bits out for eight bits in. The end result is a seven-step digital-to-analog converter that the Apple can read.

The output of the priority encoder is fed to the TTL input pins on the game port, and these in turn are monitored by the software in the computer.

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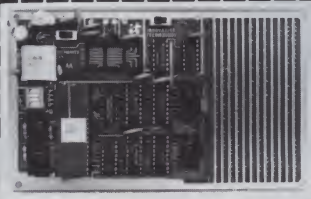

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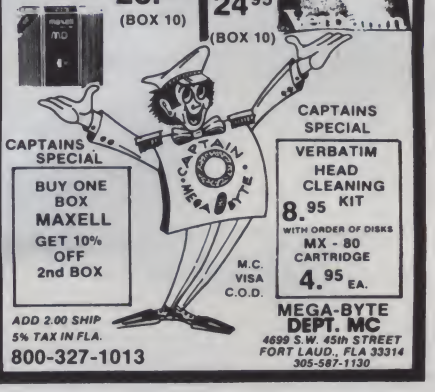

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1	LM3914 Bar Graph Driver	$2.49
1	74147 TTL Priority Encoder	.98
2	1K ⅛ Watt Resistor	.49
1	16-Pin Dip Header Plug	1.49
		Total cost: $5.94

Table 1. Apple Scope parts list.

```
LIST
 10 REM  **** SCOPE 1.0 *****
 20 CALL -936
 30 REM  REMEMBER TO LOAD THE MACHINE LANGUAGE ROUTINES BEFORE RUNNING THIS P
    ROGRAM
 40 REM      ALSO  LOMEM MUST BE SET TO 5000
 50 REM  NO TRIGGER  SWEEP=2048
 60 REM  (+)TRIGGER  SWEEP=2109
 70 REM  (-)TRIGGER  SWEEP=2126
 80 SWEEP=2048
 90 POKE 812,45
100 CALL 3072
110 INPUT "ENTER SWEEP RATE  0-255 ",SW
120 REM  *** HERES THE SWEEP PART ****
130 POKE 1,SW
140 CALL 3086
150 CALL SWEEP
160 FOR X=1 TO 255
170 Y= PEEK (2560+X)*10
180 POKE 802,Y
190 POKE 800,X
200 POKE 801,0
210 CALL 3780
220 NEXT X
230 GOTO 120
240 END
```

Listing 2. Integer Basic display.

Software

Basic is great for programming ease and for manipulating data when speed isn't important. But when you're trying to look at the output of a UART, or at the signal from your tape recorder, you may need more speed.

The answer lies in good old machine language. I decided that in order to get a decent sweep rate, the actual scanning would have to be done in machine code; then I could cheat and use Basic to plot the input data in high-resolution graphics.

I also found that it just won't work to try a real-time function—that is, to display the sweep as it occurs. The microprocessor in the Apple, or in any other small computer, is just not fast enough for that.

I decided to store a string of data from the D/A as fast as possible and then return to and display Basic. The result is sort of a sampling scope function, but not quite.

I started toying around with routines, trying to find the best one. Some had adjustable sweep rate options, some had multiple traces before clearing the screen, and some were even triggered.

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I came up with about ten different formats for different uses. You see, the adjustable sweep rate is nice and flexible, but even on its fastest range it can't come close to the high-speed no-frills version. For every extra line of code, you degrade the speed, so it depends on what you want to do as to which sweep section you use.

In all cases, I'm storing 256 bytes of data per sweep, returning to Basic, peeking the numbers back out of memory and then plotting them with high-resolution graphics. I elected to use the Integer Basic and its hi-res graphics tape to keep the speed as high as possible.

Listing 1 shows the machine-language routine for the Basic high-speed oscilloscope and a modification that will give you an adjustable sweep rate. This is manipulated by poking a number between 1 and 255 into memory location 1. The higher the number, the faster the sweep.

You'll find the Basic display program in Listing 2. Written in Integer Basic, it uses the high-resolution graphics software supplied by Apple.

The Finished Product

My prototype was built on a small card and epoxied onto a 16-pin DIP header plug that will go right into the game I/O socket. I plan to build another in an external box and to add some gain adjustments to the unit. It shows about five volts full scale.

For those with a parallel input card, the speed can be increased substantially by bringing the eight data bits straight off the LM 3914 into an input port.

The IC itself seems to be able to handle about 30 to 35 kHz, while our limited scanning can turn only about 12 kHz. I realize this isn't very fast, but it's a step in the right direction.

The next step is to build an A/D converter using the same guidelines out of discrete components and having it scanned by a real-time clock and stored in external memory. Then the computer will scan this memory as though it were its own. It's not possible to match the speed and accuracy of an expensive oscilloscope, but again, the whole plan here was to keep it cheap.

Another point that needs to be made is that this is a low-voltage device. If you were to try to look at your ac power line with this setup, you probably would spend the rest of the day scraping your Apple off the ceiling.

If you need to monitor some higher voltages and you want a safer setup, you could put some opto-isolators in between the 74147 and the game I/O port. This will at least protect the Apple's input. ■

```
0C00- A9 20 8D 2E 03 AD 57 C0
0C08- AD 53 C0 AD 50 C0 AD 2E
0C10- 03 85 1B A0 00 84 1A 98
0C18- 91 1A C8 D0 FB E6 1B A5
0C20- 1B 29 1F D0 F2 60 8D 2A
0C28- 03 8E 28 03 8C 29 03 48
0C30- 29 C0 85 26 4A 4A 05 26
0C38- 85 26 68 85 27 0A 0A 0A
0C40- 26 27 0A 26 27 0A 66 26
0C48- A5 27 29 1F 0D 2E 03 85
0C50- 27 8A C0 00 F0 05 A0 23
0C58- 69 04 C8 E9 07 B0 FB 8C
0C60- 2D 03 AA BD 7C 0B 85 30
0C68- 98 4A AD 2C 03 90 03 0A
0C70- 69 00 85 1C 60 01 02 04
0C78- 08 10 20 40 20 26 0C 51
0C80- 26 25 30 51 26 91 26 60
0C88- 48 A9 00 8D 28 03 8D 29
0C90- 03 8D 2A 03 68 48 38 ED
0C98- 28 03 48 8A ED 29 03 85
0CA0- 53 B0 0A 68 49 FF 69 01
0CA8- 48 A9 00 E5 53 85 51 85
0CB0- 55 68 85 50 85 54 68 8D
0CB8- 28 03 8E 29 03 98 18 ED
0CC0- 2A 03 90 04 49 FF 69 FE
0CC8- 85 52 8C 2A 03 66 53 38
0CD0- E5 50 85 1D A9 FF E5 51
0CD8- 8D 2B 03 AC 2D 03 B0 05
0CE0- 0A 20 18 0D 38 A5 54 65
0CE8- 52 85 54 A5 55 E9 00 85
0CF0- 55 E6 1D D0 05 EE 2B 03
0CF8- F0 35 B1 26 45 1C 25 30
0D00- 51 26 91 26 A5 53 B0 D8
0D08- 20 5B 0D 18 A5 54 65 50
0D10- 85 54 A5 55 65 51 50 D7
0D18- 10 16 46 30 90 11 88 10
0D20- 02 A0 27 A9 40 85 30 8C
0D28- 2D 03 A5 1C 0A 26 1C 60
0D30- 06 30 10 FB A9 01 C8 C0
0D38- 28 90 EA A0 00 B0 E6 18
0D40- A5 51 29 04 F0 0A B1 26
0D48- 45 1C 25 30 51 26 91 26
0D50- A5 51 65 53 29 03 C9 02
0D58- 6A B0 BD 30 30 18 A5 27
0D60- 2C B9 0D D0 22 06 26 B0
0D68- 1A 2C BA 0D F0 05 69 1F
0D70- 38 B0 12 69 23 48 A5 26
0D78- 69 B0 B0 02 69 F0 85 26
0D80- 68 B0 02 69 1F 66 26 69
0D88- FC 85 27 60 18 A5 27 69
0D90- 04 2C B9 0D D0 F3 06 26
0D98- 90 19 69 E0 18 2C BB 0D
0DA0- F0 13 A5 26 69 50 49 F0
0DA8- F0 02 49 F0 85 26 AD 2E
0DB0- 03 90 02 69 E0 66 26 90
0DB8- D0 1C 03 04 84 1A 86 1B
0DC0- AA 4A 4A 4A 4A 85 53 8A
0DC8- 29 0F AA BC 18 0E 84 50
0DD0- 49 0F AA BC 19 0E C8 84
0DD8- 52 AC 2D 03 A2 00 A1 1A
0DE0- 85 51 A2 80 86 54 86 55
0DE8- AE 2F 03 A5 54 38 65 50
0DF0- 85 54 90 04 20 3F 0D 18
0DF8- A5 55 65 52 85 55 90 03
0E00- 20 40 0D CA D0 E5 A5 51
0E08- 4A 4A 4A D0 D3 E6 1A D0
0E10- 02 E6 1B A1 1A D0 C9 60
0E18- FF FE FA F4 EC E1 D4 C5
0E20- B4 A1 8D 78 61 49 31 18
0E28- FF 84 1A 86 1B 85 53 AC
0E30- 2D 03 A2 00 A1 1A 85 51
0E38- AE 2F 03 20 3F 0D CA D0
0E40- FA A5 51 4A 4A 4A D0 EE
0E48- E6 1A D0 02 E6 1B A1 1A
0E50- D0 E4 60 A5 26 0A A5 27
0E58- 29 03 2A 05 26 0A 0A 0A
0E60- 8D 2A 03 A5 27 4A 4A 29
0E68- 07 0D 2A 03 8D 2A 03 AD
0E70- 2D 03 0A 6D 2D 03 0A AA
0E78- CA A5 30 E8 4A D0 FC 8D
0E80- 29 03 8A 18 6D 2D 03 90
0E88- 03 EE 29 03 8D 28 03 60
0E90- 29 03 4A 90 02 09 AA 4A
0E98- 90 02 69 A9 8D 2C 03 60
0EA0- FF FF FF FF FF FF FF FF
0EA8- FF FF FF FF FF FF FF FF
0EB0- FF 8E 23 03 AD 22 03 AE
0EB8- 20 03 AC 21 03 20 26 0C
0EC0- AE 23 03 60 20 B1 0E 4C
0EC8- 7F 0C 8E 23 03 AD 20 03
0ED0- AE 21 03 AC 22 03 20 95
0ED8- 0C AE 23 03 60 8E 23 03
0EE0- AD 26 03 8D 2F 03 AD 27
0EE8- 03 AC 24 03 AE 25 03 20
0EF0- BC 0D AE 23 03 60 FF FF
0EF8- FF FF FF FF FF FF FF FF
0F00- 80 83 86 89 8C 8F 92 95
0F08- 98 9C 9F A2 A5 A8 AB AE
0F10- B0 B3 B6 B9 BC BF C1 C4
0F18- C7 C9 CC CE D1 D3 D5 D8
0F20- DA DC DE E0 E2 E4 E6 E8
0F28- EA EC ED EF F0 F2 F3 F5
0F30- F6 F7 F8 F9 FA FB FC FC
0F38- FD FE FE FF FF FF FF FF
0F40- FF FF FF FF FF FF FE FE
0F48- FD FC FC FB FA F9 F8 F7
0F50- F6 F5 F3 F2 F0 EF ED EC
0F58- EA E8 E6 E4 E2 E0 DE DC
0F60- DA D8 D5 D3 D1 CE CC C9
0F68- C7 C4 C1 BF BC B9 B6 B3
0F70- B0 AE AB A8 A5 A2 9F 9C
0F78- 98 95 92 8F 8C 89 86 83
0F80- 7F 7C 79 76 73 70 6D 6A
0F88- 67 63 60 5D 5A 57 54 51
0F90- 4F 4C 49 46 43 40 3E 3B
0F98- 38 36 33 31 2E 2C 2A 27
0FA0- 25 23 21 1F 1D 1B 19 17
0FA8- 15 13 12 10 0F 0D 0C 0A
0FB0- 09 08 07 06 05 04 03 03
0FB8- 02 01 01 00 00 00 00 00
0FC0- 00 00 00 00 00 00 01 01
0FC8- 02 03 03 04 05 06 07 08
0FD0- 09 0A 0C 0D 0F 10 12 13
0FD8- 15 17 19 1B 1D 1F 21 23
0FE0- 25 27 2A 2C 2E 31 33 36
0FE8- 38 3B 3E 40 43 46 49 4C
0FF0- 4F 51 54 57 5A 5D 60 63
0FF8- 67 6A 6D 70 73 76 79 7C
```

Listing 3. Machine-language, high-resolution graphics program supplied by Apple.

Atari's Joystick/ Printer Connection

With a little sleight of hand, you can "fool" your Atari into accommodating a printer through its joysticks ports.

By Clifford Engels

Have you been looking for a way to attach an 80-column printer to your Atari without the expense of purchasing an interface module? If so, why not attach your printer to the joystick ports? It takes only two steps:

1. Make or buy a cable that attaches your printer to the joystick ports.

2. Code a driver or handler program that will operate the printer through the joystick ports.

Before we can proceed, we need to cover some information on how the joystick ports operate and interface with the Atari OS and CIO (central I/O utility).

Joystick Interfacing

The joystick ports on the Atari are connected to a 6520 PIA chip as shown in Fig. 1. The 6520 has two eight-bit bidirectional ports. These ports normally are connected to the joystick switches through the joystick ports. The Atari's data bus bits 0 to 3 are connected to joystick port 1, pins 1 to 4, through one-half of the 6520's A port. Data bus bits 4 to 7 are connected to joystick port 2, pins 1 to 4, through the remaining half of the 6520's A port. The data bus is connected to joystick ports 3 and 4 in an identical manner through the 6520's B port.

In addition to the data lines, each port on the 6520 has status and control lines. Unfortunately, these lines are not available at the joystick ports. To clarify Fig. 1, I have shown the data bus in a logically reverse order. Bit 0, the low-order bit, is on the left. Bit 7, the high-order bit, is on the right.

Each port on a 6520 has three memory-addressable registers—the control register, the data direction register and the data register—that control that port's operation. The data direction and the data registers share the same address.

Bit 2 of the control register determines if the data direction or the data register is selected. If bit 2 = 0, the data direction register will be addressed. If bit 2 = 1, the data register will be addressed. Port A of the 6520 uses addresses $D302 for the control register and $D300 for the data direction and data registers. Port B uses addresses $D303 for the control register and $D301 for the data direction and data registers.

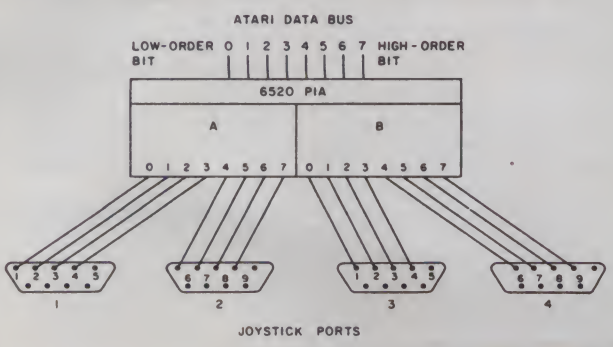


Fig. 1. Block diagram of the data path from the Atari data bus to the joystick ports.

The 6520 is initialized for input operation by Atari's OS and CIO. This allows the joystick switches to be read by any program. If we want to output data to a printer or any other device from the joystick ports, we must reinitialize the 6520 for output operations.

An initializing sequence would be:

1. Store #$38 in $D302 for the A port or #$30 in $D303 for the B port. Bit 3 of the A port and bits 4 and 5 for both ports are set to 1 to ensure compatibility with OS. This step will allow us to address the data direction register in the next step.

2. Store #$FF in $D300 for the A port or $D301 for the B port. This will condition all bits of the port for output operation.

3. Store #$3C in $D302 for the A port or #$34 in $D303 for the B port. This step will allow us to address the data register and output data to the printer on subsequent steps.

Central I/O Utility

Next, the Atari CIO. This is a part of the Atari OS and is a common interface to I/O devices and the outside world. If you're using Basic or the Editor Assembler, the CIO will be invoked automatically as a result of the issuing of any input or output command, such as LPrint, List, Get, Put or Input.

When the CIO is invoked, it will search the Atari's device table for an address to a device handler vector table. The device table has a three-byte entry for each I/O device, as shown in Fig. 2.

The first byte in each entry is the

Address correspondence to Clifford Engels, 2812 Arlington Place, Fremont, CA 94536.

ASCII character, which represents that unique I/O device. (For example, the printer uses the character P and the cassette uses a C.) This character is followed by the address of the handler vector table for that device. If we want to access the printer, the CIO will search for the ASCII character P and then use the next two bytes as a jump address to the printer's handler vector table.

The handler vector table for each device is 16 bytes long and contains entry-point addresses for the various I/O driver or handler routines, such as Open, Close, Get or Put. The CIO then jumps to the correct driver or handler routine, using the address in the handler vector table.

The selection of the proper address and routine is determined by the command byte in the IOCB (I/O control block). This command byte was set up by the Basic or Assembler cartridge as a result of the issuing of any input or output command.

The device driver or handler routine controls all data going to or from the I/O device, along with any handshaking required by the device.

Our plan of attack should be clearing up. All you do is write a driver program and a handler vector table. Then, store the address of the new handler vector table into the device table. The Atari CIO won't know the difference and will use the driver routine as if it were the original Atari print driver.

Attaching the Printer

Enough theory. *Let's* get on with the attaching of the printer.

The first step involves the cable that will attach the printer to the joystick ports. The connections for this cable are shown in Fig. 3. Notice that the strobe line is connected to data out bit 7 at the joystick port. This is because the joystick ports have only eight data lines available.

We *could* use a third port for the strobe line, but one look at an ASCII code chart will tell you that none of

Listing 1. Assembler listing for non-DOS version of the print driver program.

```
                10 ;    ATARI JOYSTICK PRINT DRIVER
                20 ;        CLIFFORD J. ENGELS
                30 ;        2812 ARLINGTON PL.
                40 ;        FREMONT, CA. 94536
                50 ;
                60 ;
0000            0100        .OPT NOEJECT
0000            0110        *=   $600
0600 209E06     0120 ASMENT JSR  INITA      ASSEMBLER ENTRY POINT
0603 00         0130        BRK
0604 4C9D06     0140 BASENT JMP  INITB      BASIC ENTRY POINT
D301            0150 PDATA  =     $D301     PORT DATA REGESTER
D303            0160 PTCTL  =     $D303     PORT CONTROL REGESTER
D013            0165 PTRIG  =     $D013     TRIGGER INPUT/BUSY SENSE
0607 1D06       0170 HVTAB  .WORD OPEN-1    OPEN VECTOR
0609 9906       0180        .WORD RET-1     CLOSE VECTOR
060B 9906       0190        .WORD RET-1     GET VECTOR
060D 3906       0200        .WORD WRITE-1   PUT VECTOR
060F 9906       0210        .WORD RET-1     STATUS VECTOR
0611 9906       0220        .WORD RET-1     SPECIAL VECTOR
0613 4C         0230        .BYTE $4C,$78,$EE,00 INIT ADDR
0614 78
0615 EE
0616 00
0617 00         0240 LSCTR  .BYTE 00        LINE SPACE COUNTER
0618 00         0250 CHCTR  .BYTE 00        LINE LENGTH COUNTER
0619 00         0260 TXCTR  .BYTE 00        TEXT LENGTH COUNTER
061A 01         0270 LSCNT  .BYTE 01        LINE SPACE DEFAULT
061B 50         0280 CHCNT  .BYTE 80        LINE LENGTH COUNT DEFAULT
061C 3C         0290 TXCNT  .BYTE 60        TEXT LENGTH DEFAULT
061D 06         0300 OFCNT  .BYTE  6        OVERFLOW SKIP DEFAULT
                0310 ;
                0320 ;OPEN ROUTINE
                0330 ;
061E A930       0340 OPEN   LDA  #$30       ALLOW ADDRESS
0620 8D03D3     0350        STA  PTCTL      DIRECTION REGISTER
0623 A9FF       0360        LDA  #$FF       ALL BITS
0625 8D01D3     0370        STA  PDATA      OUT
0628 A934       0380        LDA  #$34       ALLOW ADDRESS
062A 8D03D3     0390        STA  PTCTL      DATA REGESTER
062D A980       0400        LDA  #$80       INSURE STROBE
062F 8D01D3     0410        STA  PDATA      RESET PORT
0632 AD1C06     0420        LDA  TXCNT      LOAD TEXT LENGTH COUNT
0635 8D1906     0430        STA  TXCTR      STORE IN TEXT LENGTH CTR
0638 D054       0440        BNE  DONE       DO MORE SETUP
                0450 ;
                0460 ;PRINT ROUTINE
                0470 ;
063A C99B       0480 WRITE  CMP  #$9B       TEST FOR ATASCII EOL CHAR
063C D002       0490        BNE  PRT        NO
063E A90D       0500 PRTCR  LDA  #$0D       LOAD ASCII C/R CHAR
```

More

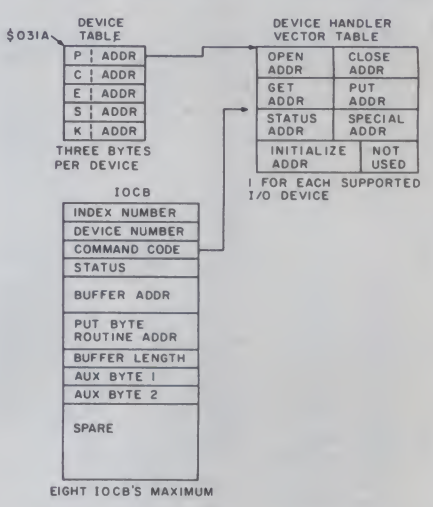
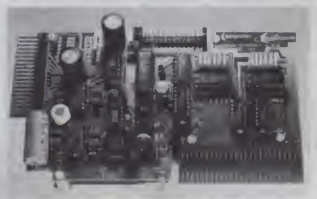


Fig. 2. This diagram shows the contents and relationships of the various control blocks used by the CIO.

A/D 8 channels + D/A 8 channels



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the printable characters use the high-order bit. This means we can tie bit 7 at the printer to a logic 0 and the printer still will operate. Obviously, any printer function that uses bit 7 will be inoperative. The printer busy line is sensed by the joystick trigger input on ports 2 or 4.

I didn't include a point-to-point cable diagram because each printer uses different plug designs and connections. Consult your printer manual for the correct plug and connections.

The second step is the software driver that's necessary to make the printer operate. I've included the following functions to make the driver program more versatile:

1. Adjustable line length and spacing.
2. Adjustable page overflow and length.

This driver program should be loaded and run as the first program after power up. If you're using the Assembler, load the driver using the following instructions:

1. Load the object code or enter and assemble the source code.
2. Enter debug.
3. Enter G600, and press return. This will execute the program.
4. Return to edit.

If you're using the Basic cartridge, load and run the Basic version of this program. After the program has run and initialized, it does not have to be run again.

Listing 1 continued.

```
0640 AC13D0 0510 PRT    LDY  PTRIG      TEST FOR BUSY RESET
0643 D0FB   0520        BNE  PRT        NO
0645 A8     0530        TAY            YES-SAVE ACCUM
0646 0980   0540        ORA  #$80      INSURE STROBE RESET
0648 8D01D3 0550        STA  PDATA     OUTPUT TO PORT
064B 297F   0560        AND  #$7F      SET STROBE
064D 08     0570        PHP            SAVE PROC STATUS
064E 78     0580        SEI            DISABLE INTERRUPTS
064F 8D01D3 0590        STA  PDATA     OUTPUT TO PORT
0652 A20A   0600        LDX  #10       LOAD STROBE DELAY
0654 CA     0610 DLY    DEX
0655 D0FD   0620        BNE  DLY
0657 A980   0630        LDA  #$80      RESET DATA
0659 8D01D3 0640        STA  PDATA     OUTPUT TO PORT
065C 28     0650        PLP            RESTORE PROC STATUS
065D 98     0660        TYA            RESTORE ACCUM
            0670 ;
            0680 ;CARR RET / LINE FEED ROUT
            0690 ;
065E C90D   0700        CMP  #$0D      TEST FOR C/R
0660 F01D   0710        BEQ  LINFD     YES
0662 C90A   0720        CMP  #$0A      TEST FOR L/F
0664 F007   0730        BEQ  PAGECT    YES
0666 CE1806 0740        DEC  CHCTR     NO-VALID CHAR
0669 F0D3   0750        BEQ  PRTCR     LAST PRINT CHAR?
066B D02D   0760        BNE  RET       NO-RETURN
066D AE1906 0770 PAGECT LDX  TXCTR     LAST PRT LINE?
0670 D00D   0780        BNE  LINFD     NO
0672 AD1D06 0790        LDA  OFCNT     GET OVERFLOW SKIP COUNT
0675 8D1706 0800        STA  LSCTR     STORE IN LINE SPACE CTR
0678 18     0810        CLC            INSURE CARRY RESET
0679 6D1C06 0820        ADC  TXCNT     ADD TEXT LENGTH COUNT
067C 8D1906 0830        STA  TXCTR     STORE IN TEXT LENGTH CTR
067F AE1706 0840 LINFD  LDX  LSCTR     TEST FOR REMAINING LINE SPACES
0682 F00A   0850        BEQ  DONE      NONE REMAINING
0684 CE1706 0860        DEC  LSCTR     YES-DEC LINE SPACE CTR
0687 CE1906 0870        DEC  TXCTR     DEC TEXT LENGTH CTR
068A A90A   0880        LDA  #$0A      LOAD L/F CHAR
068C D0B2   0890        BNE  PRT       SEND IT
068E AD1B06 0900 DONE   LDA  CHCNT     RESTORE LINE
0691 8D1806 0910        STA  CHCTR     LENGTH COUNTER
0694 AD1A06 0920        LDA  LSCNT     RESTORE LINE
0697 8D1706 0930        STA  LSCTR     SPACE COUNTER
069A A001   0940 RET    LDY  #1        SET RETURN CODE
069C 60     0950        RTS            RETURN TO CALLER
            0960 ;
            0970 ;INITIALIZATION AND SYSTEM RESET ROUTINE
            0980 ;
069D 68     0990 INITB  PLA                          POP STACK FOR BASIC
069E A99E   1000 INITA  LDA  #INITA & $00FF          STORE SYSTEM
06A0 850C   1010        STA  $0C                     RESET ENTRY
06A2 A906   1020        LDA  #INITA/256              POINT ADDRESS
06A4 850D   1030        STA  $0D
06A6 A901   1040        LDA  #1                      SET FLAG TO
06A8 8509   1050        STA  $9                      INDICATE SUCCESS
06AA A907   1060        LDA  #HVTAB&$00FF            STORE HANDLER
06AC 8D1B03 1070        STA  $031B                   VECTOR TABLE
06AF A906   1080        LDA  #HVTAB/256              ADDRESS IN
06B1 8D1C03 1090        STA  $031C                   DEVICE TABLE
06B4 60     1100        RTS
```

Driver Program Routines

The driver program itself is relatively simple. The four main routines are: open, print, carriage return/line-feed and initialization. The close routine is simply a return to caller.

The first three instructions are entry points for Basic and Editor Assembler. The next 16 bytes of the program make up the handler vector table. The only vectors we use are: open, close and put; the unused vectors point to the close routine. Notice that the vectors point to their respective entry points–1. This is a requirement of the Atari OS.

The next seven bytes are the default values and counters for line spacing, line length, text length and overflow skip count. Line spacing is controlled by the value in location $061A. Use 1 for single-spacing, 2 for double-spacing and 3 for triple-spacing.

The number of characters in a print line is controlled by the value in location $061B. The default value in this program will print an 80-character line.

Location $061C contains the value for the number of lines of text on a page. This value, along with the overflow skip count in location $061D, will give a limited degree of page formatting. These two values, when added, must equal the number of print lines possible on a page. For example,

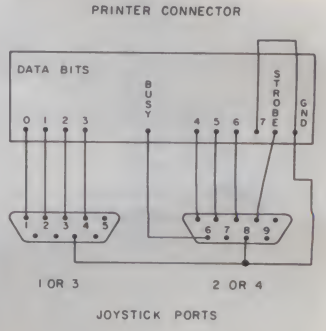

Fig. 3. Printer-to-joystick port cable diagram.

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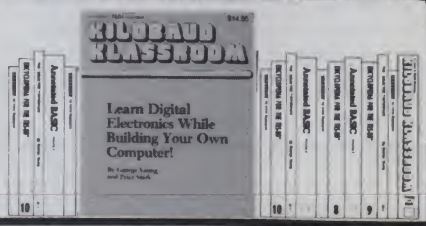

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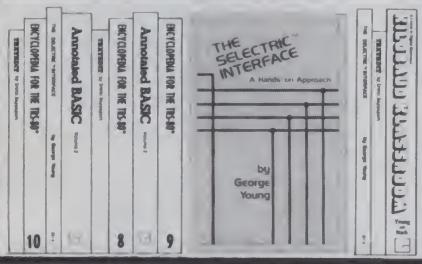

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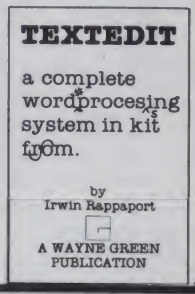

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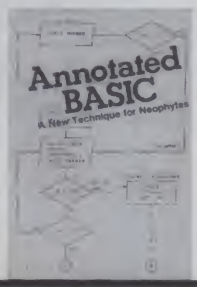

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11-inch paper at six-lines-per-inch spacing would allow 66 print lines per page.

Top and bottom margins can be obtained by adjusting the text and overflow counts as necessary. For example, if you want a six-line top and bottom margin, set the text count to 54 and the overflow skip count to 12. Manually adjust the top margin on the first page prior to printing. The printer will print 54 lines and then space 12 lines, giving the required six-line top and bottom margins.

Any or all of these default values may be changed prior to loading the program, or after loading, by poking or changing the correct storage location.

Open Routine

Next is the open routine; it functions identically to the sample described earlier. In addition, the open routine loads the various page-formatting values into their respective counters.

There are two functions included in the print routine. First, substitute an ASCII carriage return character for every ATASCII EOL character found. Second, perform the required handshaking to send the print character to the printer. The only unique thing here is saving the processor status and disabling interrupts prior to setting the strobe pulse active.

I found this step necessary because if the Atari vblank interrupt occurred when the strobe pulse was active, my printer would print extra characters. Setting the interrupt disable bit will shorten the length of the vblank interrupt. The PLP instruction will restore the processor status after the strobe pulse is reset.

Next is the carriage return/linefeed subroutine. This subroutine has several functions. The first is to keep count of the number of print characters on a line and to send a carriage return character if the amount of characters to be printed on a line exceeds the default value in the driver program. This will prevent the printhead from jamming on the right side of the carriage.

Listing 2. Basic listing for the non-DOS version of the print driver program.

```
32200 ST=1536:RESTORE 32240
32210 READ A:IF A=999 THEN 32230
32220 POKE ST,A:ST=ST+1:GOTO 32210
32230 A=USR(1540):END
32240 DATA 32,158,6,0,76,157,6,29,6,153
32250 DATA 6,153,6,57,6,153,6,153,6,76
32260 DATA 120,238,0,0,0,0
32261 DATA 1
32262 REM LINE SPACE COUNT CHANGE ABOVE OR POKE 1562
32263 DATA 80
32264 REM CHARACTER COUNT CHANGE ABOVE OR POKE 1563
32265 DATA 60
32266 REM TEXT COUNT CHANGE ABOVE OR POKE 1564
32267 DATA 6
32268 REM OVERFLOW COUNT CHANGE ABOVE OR POKE 1565
32270 DATA 169,48,141,3,211,169,255,141,1,211
```

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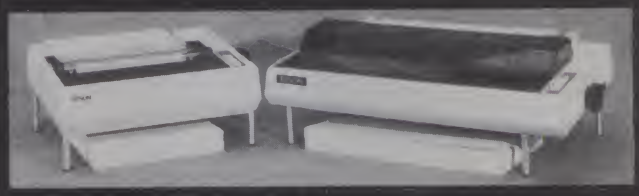

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Listing 2 continued.

```
32280 DATA 169,52,141,3,211,169,128,141,1,211
32290 DATA 173,28,6,141,25,6,208,84,201,155
32300 DATA 208,2,169,13,172,19,208,208,251,168
32310 DATA 9,128,141,1,211,41,127,8,120,141
32320 DATA 1,211,162,10,202,208,253,169,128,141
32330 DATA 1,211,40,152,201,13,240,29,201,10
32340 DATA 240,7,206,24,6,240,211,208,45,174
32350 DATA 25,6,208,13,173,29,6,141,23,6
32360 DATA 24,109,28,6,141,25,6,174,23,6
32370 DATA 240,10,206,23,6,206,25,6,169,10
32380 DATA 208,178,173,27,6,141,24,6,173,26
32390 DATA 6,141,23,6,160,1,96
32393 REM
32394 REM INITIALIZATION AND SYSTEM RESET ROUTINE FOLLOWS
32395 REM
32396 DATA 104,169,158
32400 DATA 133,12,169,6,133,13,169,1,133,9
32410 DATA 169,7,141,27,3,169,6,141,28,3
32420 DATA 96,999
```

```
069D          0955         .OPT LIST
              0960 ;
              0970 ;INITIALIZATION AND SYSTEM RESET ROUTINE
              0980 ;DOS VERSION
              0990 ;
069D 68       1000 INITB   PLA                    POP STACK FOR BASIC
069E A50C     1010 INITA   LDA  $0C                SAVE DISK
06A0 8DBF06   1020         STA  DSKINT+1          INITIALIZATION
06A3 A50D     1030         LDA  $0D               ADDRESS
06A5 8DC006   1040         STA  DSKINT+2
06A8 A9BB     1050         LDA  #RESET & $00FF    STORE SYSTEM
06AA 850C     1060         STA  $0C               RESET ENTRY
06AC A906     1070         LDA  #RESET/256        POINT ADDRESS
06AE 850D     1080         STA  $0D
06B0 A907     1090 LDHTAB  LDA  #HVTAB & $00FF    STORE HANDLER
06B2 8D1B03   1100         STA  $031B             VECTOR TABLE
06B5 A906     1110         LDA  #HVTAB/256        ADDRESS IN
06B7 8D1C03   1120         STA  $031C             DEVICE TABLE
06BA 60       1130         RTS
06BB 20B006   1140 RESET   JSR  LDHTAB            SYSTEM RESET ENTRY POINT
              1150 ; JUMP TO DISK INITIALIZATION ROUTINES
              1160 ; THE ADDRESS PORTION OF THIS INSTRUCTION
              1170 ; WILL BE MODIFIED BY THE INITIALZATION
              1180 ; ROUTINE ABOVE
06BE 4CBE06   1190 DSKINT JMP  DSKINT            JUMP TO DOS INITIALIZATION
```

Listing 3. DOS initialization and system reset routine. Replace lines 960 through 1100 of Listing 1 with these lines if you are using DOS.

```
32393 REM
32394 REM DOS INITIALIZATION AND SYSTEM RESET FOLLOWS
32395 REM
32396 DATA 104,165,12
32400 DATA 141,191,6,165,13,141,192,6,169,187
32410 DATA 133,12,169,6,133,13,169,7,141,27
32420 DATA 3,169,6,141,28,3,96,32,176,6
32430 DATA 76,190,6,999
```

Listing 4. DOS initialization and system reset routine. Replace lines 32393 through 32420 of Listing 2 with these lines if you are using DOS.

The next function is to send the amount of linefeed characters specified for proper line spacing, and to keep count of the number of print lines per page. When the number of print lines equals the text count, this subroutine will insert the proper number of linefeed characters to form the top and bottom margins.

Routine Explaining

The initialization and system reset routines require a short explanation.

The initialization routine substitutes the print handler vector table address for the system-supplied address in the device table. The CIO will jump to our handler—instead of to the OS print handler—for print operations.

Unfortunately, Atari's OS reinitializes the device table during a system reset. This means our device handler vector table address will be overlaid by the OS-supplied address whenever the system reset button is pushed.

The driver program overcomes this problem by jumping to a subroutine that reinserts our handler vector table address into the device table during a system reset. The jump address for this subroutine is stored at locations $0C and $0D by the initialization routine when this program is first run.

If you're using DOS, the values at location $0C and $0D must first be saved. These values form the address for DOS initialization during system reset. You must jump to this address, after modifying the device table with our handler vector table address, so that DOS can be initialized after a system reset.

If you're not using DOS, the values in location $0C and $0D don't have to be saved. You must, however, store a #01 into location $09. Then, after modifying the device table with the handler vector table address, issue an RTS instruction instead of jumping to the DOS initialization address.

In Summary . . .

There are two initialization and system reset routines for this program—the DOS version and the non-DOS version. The one you choose depends on how your system is configured.

The non-DOS versions of the entire program are shown in Listing 1 for the Assembler and Listing 2 for Basic. The DOS initialization routines are shown in Listing 3 for the Assembler and Listing 4 for Basic. Replace the initialization routine only if you are using DOS.

And that wraps it up. I told you it was easy.■

The Born-Again Word Processor

Here's a simple text processing program for the C-64 that was originally published for the Apple in* Microcomputing. *With the plethora of programs that can be converted for the C-64, you needn't be suffering from a lack of software for this system.

By Gary McClellan

Program listing. The author's text processor for the C-64 was adapted from Henry Simpson's "A Simple Text Processor," which appeared in the May 1981 Microcomputing.

```
2 POKE53281,1:POKE53280,12
10 LM=5:LL=70:PS=3:PE=3:RP=1:RE=500:REM DEFAULT PRINT PARAMETERS
15 RO$=CHR$(18):RF$=CHR$(146):CL$=CHR$(157):CR$=CHR$(29):CD$=CHR$(17)
17 CU$=CHR$(145):HO$=CHR$(19)
20 DIMA$(500):Z=65536:GOTO380
23 REM **********************************
25 REM *                                *
27 REM * A SIMPLE TEXT PROCESSOR FOR    *
29 REM *       THE COMMODORE 64         *
31 REM *     BY GARY D. MCCLELLAN       *
33 REM *                                *
35 REM * ADAPTED FROM 'A SIMPLE TEXT    *
37 REM * PROCESSOR' BY HENERY SIMPSON   *
39 REM *    MICROCOMPUTING, MAY 1981    *
41 REM *                                *
43 REM **********************************
70 REM **** AVAILABLE MEMORY SUBROUTINE ****
80 M=FRE(0):IFM<0THENM=M+Z
90 PRINT"      ";CHR$(18)"BYTES REMAINING: ";M:RETURN
95 REM  *** EDIT TEXT BLOCK ROUTINE ***
100 PRINTCHR$(147);"----------------------------------------";
102 PRINTRO$"REF#";P;RF$:FORX=1TO8:PRINT:NEXTX
104 PRINT"----------------------------------------"
106 PRINT"    CLR/HOME KEY: CURSOR TO END OF LINE."
108 PRINT"  SHIFT CLR/HOME: CURSOR TO BEGINNING OF
110 PRINT" CRSR LEFT/RIGHT: CURSOR MOVES LEFT AND
112 PRINT"    INST/DEL KEY: DELETE CHARACTER."
114 PRINT"  SHIFT INST/DEL: INSERT SPACES IN LINE."
116 PRINT"      RETURN KEY: RETURN TO REVIEW MODE."
118 IFA$(P)=""THENA$(P)=" "
120 PRINTHO$CD$CD$:A$(P)
122 L=1:PRINTHO$CD$CD$RO$;MID$(A$(P),L,1);CL$;
124 GETE$:IFE$=""THEN124
126 E=ASC(E$):IFE=13THENGOTO174
128 IFE>31ANDE<96THENGOTO162
130 IFE=29ANDL+1>240THENGOTO124
132 IFE=29THENPRINTRF$;MID$(A$(P),L,1);:GOTO170
134 IFE=157ANDL-1<1THENGOTO124
136 IFE=157THENPRINTRF$:MID$(A$(P),L,1);:L=L-1:PRINTCL$CL$;:GOTO172
138 IFE=145ORE=17THENGOTO124
140 IFE=148ANDL+1>240THENGOTO124
142 IFE=147THENPRINTRF$;MID$(A$(P),L,1);:GOTO122
144 IFE=19THENPRINTRF$HO$CD$CD$;A$(P);CL$;:L=LEN(A$(P)):GOTO172
146 IFE<>148THENGOTO154
148 PRINTRF$;MID$(A$(P),L,1);CL$;CHR$(148);" ";CL$RO$;" ";CL$;
150 TC$=A$(P):TC$=RIGHT$(TC$,LEN(TC$)-L+1):A$(P)=LEFT$(A$(P),L-1):E$=" "
152 A$(P)=A$(P)+E$+TC$:GOTO124
154 IFE<>20THENGOTO162
156 L=L-1:   IFL<1THENGOTO122
158 TC$=A$(P):TC$=RIGHT$(TC$,LEN(TC$)-L  ):A$(P)=LEFT$(A$(P),L-1)
160 A$(P)=A$(P)+TC$:PRINTCHR$(20);:GOTO124
162 IFL+1>240THENGOTO124
164 TC$=A$(P):TC$=RIGHT$(TC$,LEN(TC$)-L):A$(P)=LEFT$(A$(P),L-1)
166 A$(P)=A$(P)+E$+TC$
168 PRINTRF$:MID$(A$(P),L,1);
170 L=L+1:IFMID$(A$(P),L,1)=""THENA$(P)=A$(P)+" "
172 PRINTRO$:MID$(A$(P),L,1);CL$;:GOTO124
174 PRINTRF$;MID$(A$(P),L,1);RETURN
240 REM **** DATA ENTRY SUBROUTINE ****
245 A$(P)=""
250 FORN=1TO240
255 GETB$:IFB$=""THEN255
260 BA=ASC(B$)
265 IFBA=20THENGOSUB1500:PRINTCHR$(157);CHR$(32);CHR$(157);:GOTO305
270 IFBA=13THENN=240:GOTO305
280 IFBA=94THENPRINT"      ";
285 IFBA=43THENPRINT
295 PRINTB$;
300 A$(P)=A$(P)+B$
305 NEXT
310 RETURN
320 REM: **** DISPLAY ROUTINE ****
```

More →

One nice thing about having six years worth of back issues of *Microcomputing* is that I seldom have to buy application software. By looking through the article index included in every December issue, I usually can find a previously published program that can be used as is, or easily converted to run on my Commodore-64.

An example is Henry Simpson's "A Simple Text Processor," which appeared in the May 1981 *Microcomputing*. The program was written to run on an Apple computer, but it operates quite well—with a few modifications—on the C-64.

The following article and listing describes the modifications and additions that were made to Simpson's original. The program supports the Commodore 1525 printer and 1541 single-drive floppy disk.

Modifications

The modified program conforms to Simpson's basic design. Text is composed at the keyboard and stored in character string elements in a string array. Each element has an assigned reference number, and each can hold 240 characters. Once created, these text blocks can be edited and reviewed, written to a floppy disk file, read from a floppy disk file or printed on the 1525 Commodore printer.

In the original program, the Apple VTAB and HTAB commands were used frequently. Since the C-64 doesn't support an equivalent VTAB command, I used print statements with cursor key commands to generate the screen formats. The cursor

Address correspondence to Gary D. McClellan, Wizard Works, PO Box 1750, Flagstaff, AZ 86002.

Listing continued.

```
330 IFA$(P)=""THENRETURN
341 IFASC(LEFT$(A$(P),1))=94THENPRINT"     ";A$(P);:RETURN
351 IFASC(LEFT$(A$(P),1))=43THENPRINT:PRINTA$(P);:RETURN
371 PRINTA$(P);:RETURN
380 REM: *** MAIN MENU ***
390 PRINTCHR$(147);CHR$(142):PRINT
405 PRINT"           ================="
410 PRINT"           =   MAIN MENU   ="
420 PRINT"           ================="
425 PRINT
430 PRINT:PRINT"     1. WRITE TEXT BLOCK"
440 PRINT PRINT"     2. REVIEW/EDIT TEXT BLOCK"
445 PRINT PRINT"     3. INSERT/COPY TEXT BLOCK"
450 PRINT:PRINT"     4. READ FROM DISK"
460 PRINT PRINT"     5. WRITE TO DISK"
470 PRINT PRINT"     6. PRINT HARD COPY"
480 PRINT:PRINT"     7. QUIT"
484 PRINT GOSUB870
485 PRINT:PRINT"     ENTER SELECTION: "
490 GETA0$:IFA0$=""THEN490
500 IFA0$="1"THEN570
510 IFA0$="2"THEN680
515 IFA0$="3"THENGOSUB2100
520 IFA0$="4"THENGOTO 1140
530 IFA0$="5"THENGOSUB1200
540 IFA0$="6"THENGOSUB1060
550 IFA0$="7"THENCLOSE200:END
560 GOTO380
570 REM **** WRITE ROUTINE ****
580 FORG=1TO500
590 IFA$(G)=""THENF=0:G=500
600 NEXT
602 PRINTCHR$(147)
603 PRINT"        ENTER REF# OR 'RETURN' FOR NEXT AVAILABLE REF#: ":INPUTF
605 IFF<00RF>500THENPRINT"ENTER 1 THRU 500 PLEASE":GOTO603
610 PRINTCHR$(147);"----------------------------------------";CHR$(14);
620 FORP=FTO500
630 PRINTCHR$(18);P;CHR$(146);
635 IFA$(P)<>""THENPRINTCHR$(18),"REF BLOCK ACTIVE":FORX=1TO100:NEXTX:GOTO660
640 GOSUB240
650 IF(A$(P)>=""THENP=500
660 NEXT
670 GOTO380
680 REM **** REVIEW/EDIT DISPLAY ****
690 PRINTCHR$(147)
700 INPUT"ENTER REF# FOR REVIEW";P
710 IFP<1ORP>500THENPRINTPO$"ENTER 1 THRU 500 PLEASE-"RF$GOTO700
720 REM **** DISPLAY TEXT REF ****
725 PRINTCHR$(147);"----------------------------------------"
730 PRINTCHR$(14),PO$;"REF#";P;RF$
740 IFA$(P)<>""THEN800
760 PRINTCHR$(18);"EMPTY"
780 GOTO820
800 GOSUB320
820 PRINTHO$:FORX=1TO8:PRINTCD$;:NEXTX
830 PRINT"----------------------------------------"
835 PRINTPO$"KEY CODES:"RF$
840 PRINT" 'F' FORWARD"
850 PRINT" 'B' BACKWARD"
860 PRINT" 'X' EXIT"
870 PRINT" 'D' DELETE"
880 PRINT" 'E' EDIT"
890 PRINT
900 PRINTPO$"CONTROL CODES:"RF$:PRINT
905 PRINT"          '@' : DOUBLE WIDTH TYPE"
910 PRINT"          '↑' : NEW PARAGRAPH"
920 PRINT"          '+' : SKIP LINE"
930 PRINT"          '←' : LEFT MARGIN"
940 PRINTPO$"CHOICE: ?";RF$
941 GETA0$:IFA0$=""THEN941
945 PRINTCHR$(147)
950 IFA0$="X"THEN380
960 IFA0$="F"ANDP<500THENP=P+1:GOTO720
970 IFA0$="F"THEN720
980 IFA0$="B"ANDP>1THENP=P-1:GOTO720
990 IFA0$="B"THEN720
1000 IFA0$="E"THENGOSUB100:GOTO720
1010 IFA0$="D"THENA$(P)="":GOTO720
1020 GOTO725
1060 REM **** MAKE HARD COPY ****
1061 PRINTCHR$(147)
1062 PRINT"CONFIGURE PRINT ROUTINE?":INPUTQ$:IFLEFT$(Q$,1)<>"Y"THEN1085
1063 PRINT"ENTER LEFT MARGIN (NUMBER OF CHARACTERS)"
1064 LM=5:INPUTLM:IFLM>70THENPRINT"1 THRU 70 PLEASE":GOTO1063
1065 PRINT"ENTER LINE LENGTH WANTED (NUMBER OF TOTAL CHARACTERS)":LL=70:INPUTLL
1066 IFLL<20ORLL>80THENPRINT"20 THRU 80 PLEASE-":GOTO1065
1067 PS=3:PRINT"ENTER TOP MARGIN (NUMBER OF LINES)"
1069 INPUTPS:IFPS<1ORPS>65THENPRINT"1 TO 65 PLEASE":GOTO1067
1071 PE=3:PRINT"ENTER BOTTOM MARGIN (NUMBER OF LINES)"
1073 INPUTPE:IFPE<1ORPE>65THENPRINT"1 TO 65 PLEASE":GOTO1071
1075 RP=1:PRINT"ENTER STARTING REF#"
1077 INPUTRP:IFRP<1ORP>500THENPRINT"1 THRU 500 PLEASE":GOTO1075
1083 RE=500:PRINT"ENTER ENDING REF#-":INPUTRE:IFRE<1ORRE>500THENGOTO1075
1085 PRINT"SET TOP OF FORM OF PRINTER. PPESS ANY KEY TO CONTINUE"
1087 GET0$:IF0$=""THEN1087
1089 REM **** TURN ON PRINTER ****
1091 OPEN4,4,7:CMD4:  GOSUB1387
1093 LM$="":FORJ=1TOLM:LM$=LM$+CHR$(32):NEXTJ:PF=0
1095 FORP=RPTORE
1097 IFA$(P)=""ANDA$(P+1)=""THENP=500:GOTO1110
1100 GOSUB1300
1110 NEXT
1120 IFPF=1THENPO$=LM$+P$:PRINTPO$
1125 PRINT#4:CLOSE4
1130 RETURN
```

More

keys, reverse on/off and home key values are assigned to string variables in lines 15 and 17 of the program and are used, instead of the Commodore graphics characters, in the listing. This was done to make for an easier-to-read listing.

The control characters used while writing new text have been modified. DEL will perform a true backspace and delete when pressed. Rather than a control key/secondary key sequence to enter control characters at the beginning of a text block, single-key control characters are used.

An up-arrow symbol will cause a new paragraph to be printed, with the starting text character indented five spaces. A left arrow symbol causes the text to start on the next line at the left-hand margin.

A plus sign causes a line skip and then continuation of the text. An ampersand will cause the text block to be printed in double-width character mode when printed on the 1525. As in the original program, pressing the return key twice returns the user to the menu.

The write function has been further modified to prompt the user for the text block to begin writing in when the function is first entered. If the return key is pressed, the first available empty text block will be selected. If the user selects a block containing text, a "ref block active" message will be displayed and the array will be searched for the next available empty block.

Extended Editing Support

The review/edit function also has been heavily modified to allow extended editing support rather than retyping over the text. After selecting the review/edit option on the menu, press the E key to put the program into edit mode. The text block will be displayed with edit commands on the bottom half of the screen. At this point, the text can be typed over or modified.

CLR/HOME will position the cursor over the beginning character of the text block. Shifted CLR/HOME will position the cursor over the last character of the text block. Cursor left and right move the cursor in the chosen direction. INST/DEL will delete the character to the left of the cursor and move the remaining text one space to the left. Shifted INST/DEL will move the character under the cursor, along with all text to the right of the cursor, one space to the right, and insert a

Listing continued.

```
1140 REM **** READ TEXT FILE ****
1142 PRINTCHR$(147):PRINT"TEXT FILE LOAD IN PROGRESS";
1145 OPEN15,8,15
1150 OPEN5,8,5,"0:TEXTFILE,S,R"
1152 GOSUB2000:IFER=1THENER=0:FI=0:GOTO1180
1155 INPUT#5,FI
1160 FORP=1TOFI:A$(P)=""
1162 GET#5,C$:IFASC(C$)<>13THENA$(P)=A$(P)+C$:GOTO1162
1175 PRINT".";:NEXT
1180 CLOSE5:CLOSE15
1182 PRINT:PRINT:PRINTFI:"TEXT BLOCKS READ. PRESS ANY KEY TO CONTINUE"
1184 GETQ$:IFQ$=""THEN1184
1190 GOTO380
1200 REM  **** WRITE TEXT FILE ****
1202 PRINTCHR$(147):PRINT"TEXT FILE SAVE IN PROGRESS":PRINT
1205 OPEN15,8,15
1210 OPEN5,8,5,"@0:TEXTFILE,S,W"
1215 GOSUB2000:IFER=1THENER=0:FI=0:GOTO1275
1240 FORP=1TO500
1245 IFA$(P)<>""THENFI=P
1250 NEXTP
1255 PRINT#5,FI
1260 FORP=1TOFI
1265 PRINT#5,A$(P)
1270 NEXTP
1275 CLOSE5:CLOSE15
1280 PRINTFI:"TEXT BLOCKS SAVED.  PRESS ANY KEY TO CONTINUE"
1285 GETQ$:IFQ$=""THEN1285
1290 RETURN
1300 REM **** PRINTER ROUTINE ****
1305 IFA$(P)=""THENRETURN
1310 TC=ASC(LEFT$(A$(P),1))
1315 IFTC=94THENGOSUB1380:CC=LM+5:B$="     " PF=1:GOTO1340
1320 IFTC=43THENGOSUB1380:PRINT:LC=LC+1:GOSUB1383:GOTO1340
1325 IFTC=64THENGOSUB1380:DW=1:PRINTCHR$(14);:GOSUB1340:GOSUB1380:RETURN
1330 IFTC=95THENGOSUB1380:GOTO1340
1335 TC$=A$(P):GOTO1345
1340 TC$=RIGHT$(A$(P),LEN(A$(P))-1):IFTC$=""THENPF=0:RETURN
1345 IFPF=0THENB$=""
1346 FORX=1TOLEN(TC$):IFB$=""ANDMID$(TC$,X,1)=CHR$(32)THENCC=CC+1:X=X+1
1350 CC=CC+1:B$=B$+MID$(TC$,X,1)
1355 IFLL-CC<10ANDMID$(TC$,X,1)=" "THENPF=1:GOSUB1380
1360 IFCC>LLTHENPF=1:GOSUB1380
1365 NEXTX:IFB$<>""THENPF=1
1375 RETURN
1380 IFPF=1ANDB$<>""THENPO$=LM$+B$:PRINTPO$:B$="":CC=LM:LC=LC+1
1381 IFDW=1THENPRINTCHR$(15);:DW=0
1383 IFLC<(66-PE)THEN1399
1385 FORI=1TOPE:PRINT:NEXTI
1387 FORI=1TOPS:PRINT:NEXTI
1389 LC=PS
1399 PF=0:RETURN
1500 REM **** DELETE KEY ROUTINE FOR WRITE BLOCK ****
1505 IFLEN(A$(P))<1THENA$(P)="":B$="":N=240:GOTO1530
1510 A$(P)=LEFT$(A$(P),LEN(A$(P))-1)
1520 IFN>10RN=1THENN=N-1
1530 RETURN
2000 REM **** DISK ERROR HANDLER ****
2010 INPUT#15,S1$,S2$,S3$,S4$
2020 IFVAL(S1$)>0THENPRINTS1$;S2$,S3$,S4$:CLOSE5:CLOSE15:ER=1
2030 RETURN
2100 PRINTCHR$(147)
2110 PRINT"'I' INSERT EMPTY BLOCK AT REF#"
2120 PRINT"'C' COPY EXISTING BLOCK TO NEW REF#"
2130 INPUT"COMMAND";O$
2140 IFO$="C"THEN2200
2150 IFO$="I"THEN2400
2160 GOTO380
2200 REM COPY BLOCK
2210 PRINT:PRINT"REF# TO COPY FROM:"
2220 INPUTP1:IFP1<00RP1>500THEN2210
2225 INPUT"REF# TO COPY TO";P
2230 IFP<00RP>500THEN2210
2240 PRINT"REF# ";P1;" WILL BE COPIED TO REF# ";P;". OK?"
2330 O$="N":INPUTO$:IFLEFT$(O$,1)="Y"THENGOTO2350
2340 GOTO380
2350 A$(P)=A$(P1)
2360 PRINT"ANOTHER COPY?:"
2370 O$="N":INPUTO$:IFLEFT$(O$,1)="Y"THENGOTO2210
2380 GOTO380
2400 REM INSERT BLANK TEXT BLOCK AT REF#
2410 PRINT:PRINT"REF# TO INSERT EMPTY TEXT BLOCK?:"
2420 INPUTP1:IFP1<00RP1>500THENGOTO2410
2430 FORP=P1TO500:IFA$(P)=""ANDA$(P-1)=""THENP2=P-1:P=500
2440 NEXTP
2450 FORX=P2TOP1STEP-1:A$(X)=A$(X-1):NEXTX
2455 A$(P1)=""
2460 PRINT"REF# ";P1;" AVAILABLE FOR TEXT INPUT"
2470 O$="N":INPUT"ANOTHER INSERT?:";O$
2480 IFLEFT$(O$,1)="Y"THEN2410
2490 GOTO380
5000 REM ******** REM VARIABLE LIST *******
5010 REM RP=STARTING REF   RE=ENDING REF   LL = LINE LENGTH
5020 REM PS = PAGE START   PE = PAGE END   LM$=LEFT MARGIN STRING
5030 REM HO$=HOME KEY      CL$=CRSR LEFT    CR$=CRSR RIGHT          CD$=CRSR DOWN
5040 REM CU$=CRSR UP       O$=TEMP VARIABLE FOR QUERYS
5050 REM A$(P)=TEXT BLOCK ARRAY            P=ARRAY POINTER         P1=TEMP POINT
5060 REM FI=TEMP VARIABLE FILE HANDLING    AO$=STRING VARIABLE MENU COMMANDS
5070 REM S1$THRUS4$=VARIABLES FOR ERROR HANDLING                   R$=WORK STRING
5080 REM TC$=TEMP WORK STRING              RO$=REVERSE ON          RF$=REV OFF
5090 REM E$=WORK STRING, EDIT              C$=WORK STRING, FILE HANDLING
5100 REM PO$=WORK STRING FOR PRINTING      PF=FLAG FOR PRINT WORK STRING STATUS
5110 REM N=COUNTER         E=ASC VALUE FOR EDIT MODE
5120 REM L=MID STRING POINTER              G=LOOP COUNTER
5130 REM DW=DOUBLE WIDTH FLAG              ER=ERROR FLAG           F=COUNTER

READY.
```

blank under the cursor. The return key will save *all* text on the screen in the text block, regardless of the cursor position, and redisplay the text block in review mode.

When editing a nearly full text block, the insert and delete text movements may not be seen when the keys are pressed. The functions are taking place, however, and by pressing the return key, the user will see the text block redisplayed in review mode with the changes made. Pressing the E key will put the display back into edit mode, and more editing can take place.

An insert/copy option lets you insert text blocks wherever needed, without destroying existing text.

The write to disk routine will save the text array to a sequential file on the floppy disk labeled Text File. A text file previously saved to disk will be written over by the new file, so care should be used when saving the file.

Since the C-64's input command will support only up to 80 characters, the routine to load the file from floppy disk uses the get command and builds each element of the array as it goes. This is rather slow, so as each element is built, a period is displayed on the screen following TEXT FILE LOAD IN PROGRESS to let the user know that a file load is occurring.

Additions

An insert/copy option was added to the menu to allow copying of a text block from one reference number to another or to allow insertion of an empty text block at any reference desired. When selected, the program will prompt the user to choose either the copy function or insert function.

If copy is selected, the program will prompt for the text block to copy from and to, and then issue a verify prompt, which must be responded to before the copy will take place. If the insert option is selected, the program will prompt the user to type in the desired reference number. The routine will shift existing text blocks one

reference number higher, starting with the reference block selected. This allows the user to insert text blocks wherever needed, without destroying existing text.

A major addition to the program is a printer formatting routine. When the hard copy option is selected, the user is prompted to choose the formatting routine or the standard default parameters.

The default values are: five-character left margin, 70-character line length (including left margin characters), three-line top margin and three-line bottom margin. As the text is being printed, the program checks for a space in the last ten characters of the line, and issues a carriage return to the printer if found. Otherwise, the line terminates when the character count reaches the line length. This results in a ragged right margin of unbroken words (providing a word longer than ten characters isn't encountered). The primary reason for this is to make the printed text more readable.

The program also prompts for top of form so it can keep track of total lines printed on a page and do a page eject (print bottom and top margins) to avoid printing on the fold of the paper. To set top of form on the 1525 printer, advance the paper until the fan fold crease is at the top of the printer ribbon.

To aid in further modification of the program, a list of all variables used starts at line 5000. The printer format defaults are initialized in line 10 and can easily be changed to suit personal requirements.■

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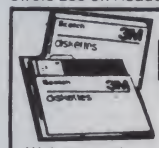

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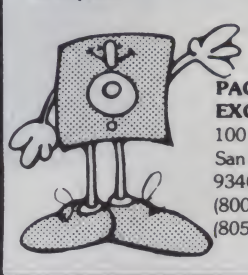

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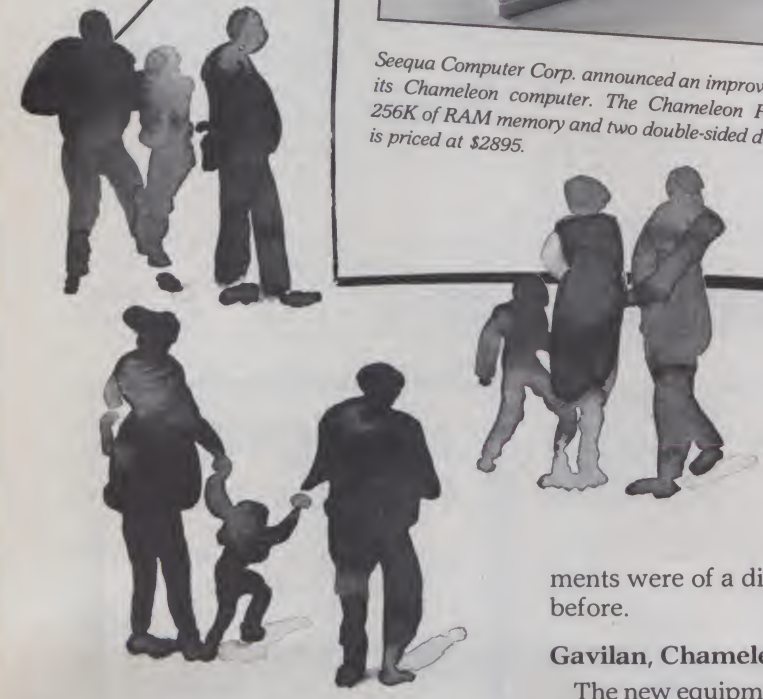
The Changing Micro Scene

While major announcements and new developments at Comdex and NCC this year were few, the shows did present a few surprises and reflected an industry in transition.

By Frank J. Derfler

Seequa Computer Corp. announced an improved version of its Chameleon computer. The Chameleon Plus features 256K of RAM memory and two double-sided disk drives. It is priced at $2895.

The Brother HR-15 daisy wheel printer provides letter-quality print at a reasonable price. It features a 3K data buffer, proportional spacing, automatic overstrike, subscripts and superscripts and many other capabilities. The retail price is $599.



The National Computer Conference and spring Comdex shows, which were held within two weeks of each other, traditionally bring a flood of new announcements. The flood this year, though, was much smaller than in previous years, and the announcements were of a different nature than before.

Gavilan, Chameleon, Tandy IV . . .

The new equipment announcements at Comdex and NCC centered around plotters, printers and other peripherals. Only one new microcomputer, the Gavilan, created a big stir—even though it was exhibited only in prototype and won't be available until the end of the year. (Gavilan Computer Corp. is located at 240 Hacienda Ave., Campbell, CA 95008.)

The Chameleon Plus from Seequa (209 West St., Annapolis, MD 21401) was there in the flesh, but the system is back-ordered for many months. The Chameleon, a $1995 portable, can run both IBM PC and CP/M-80 programs.

Tandy displayed the Model IV, but everyone seemed happier about the news that Tandy will support CP/M. The Tandy 100 drew large crowds that were ready to buy. Apple's Lisa drew

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Mannesmann Tally is taking an aggressive position in the printer market. Its MT 160 is a compact unit able to produce either data processing quality or correspondence quality text. It sells for $798.

Hard disk systems are being reduced in price and they are becoming more popular with users. The classic problem is, "How do you back up a ten-megabyte hard disk?" Sysgen, Inc. demonstrated a streaming tape system able to copy a hard disk at the rate of 2.5 megabytes per minute. A back-up system for the IBM PC XT retails for $995. Sysgen is located at 47853 Warm Springs Blvd., Fremont, CA 94539.

large crowds, but they weren't ready to buy. The modem makers had some new releases, and both Hayes Microcomputer Products and U.S. Robotics showed interesting new modems.

Apple/IBM Compatibility

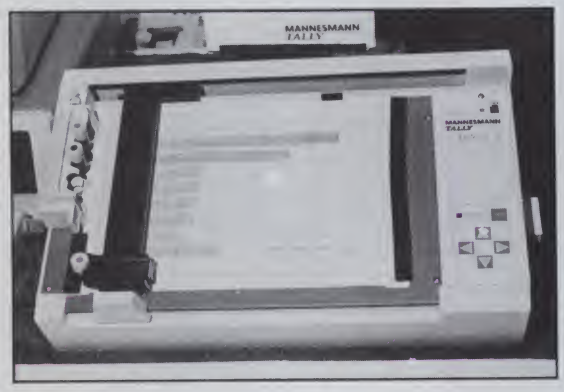
The people at the Quadram booth amazed visitors with their demonstrations of Apple II software running on the IBM PC. The secret was a new board for the IBM called the QuadLink. It gives the IBM the ability to read and write Apple II disks and to run Apple II software. Quadram seems to have found a big audience of people and businesses who have Apples and PCs and who would like to share files and software between them.

Quadram Corp. will tell you more about QuadLink if you write them at 4357 Park Drive, Norcross, GA 30093.

STM Electronics Corp. also hit a new philosophical note when it made

The Gavilan was the hardware release that captured everyone's attention. This battery-powered 16-bit microcomputer includes an eight-line by 66-character liquid crystal display screen, a 300-baud modem and an internal three-inch floppy disk drive. A unique touch pad on the front of the machine serves as an input device for the specially designed software. The Gavilan is designed to be in the $4000 price range. A battery-operated correspondence quality printer is an option. Production units are expected to be available by the end of 1983.

The Pied Piper combines a full keyboard, single 800K disk drive, Z-80 processor, video interface and a great deal of CP/M software into one lightweight package with a handle. The price is $1299. The concept behind the Pied Piper is that it is relatively easy to preposition video monitors at home and at the office. You can easily carry the computer unit between work locations and have two capabilities for nearly the price of one.

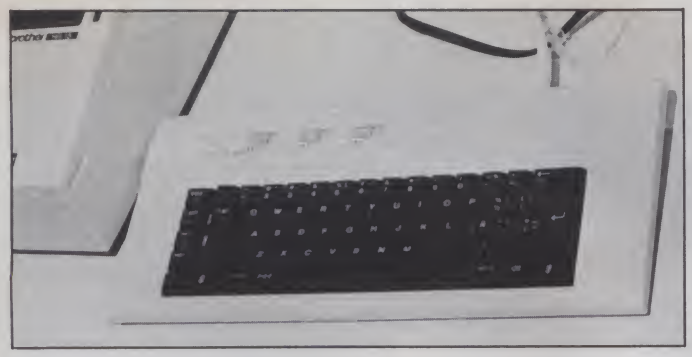


The Mannesmann Tally plotter joined several new plotters in the market. It provides a three-pen capability and sells for $795. An RS-232C serial capability is available for another $85.

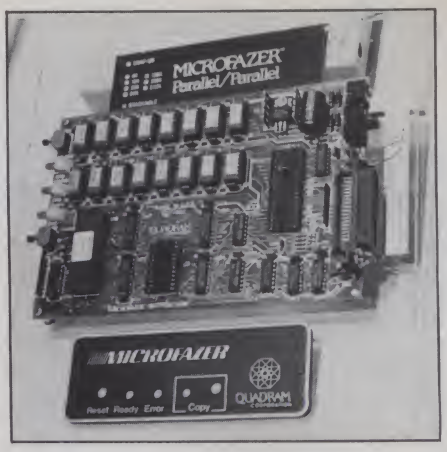
us realize that a portable computer doesn't always have to include a built-in display. Monitors are the largest and heaviest part of most portable microcomputers, but because they have a relatively low price, monitors can be prepositioned at the most common working locations.

STM's Pied Piper portable microcomputer is designed to be used with any available monitor. It costs $1299 and runs a full line of CP/M software. The address for STM Electronics Corp. is 525 East Middlefield Road, Suite 130, Menlo Park, CA 94025.

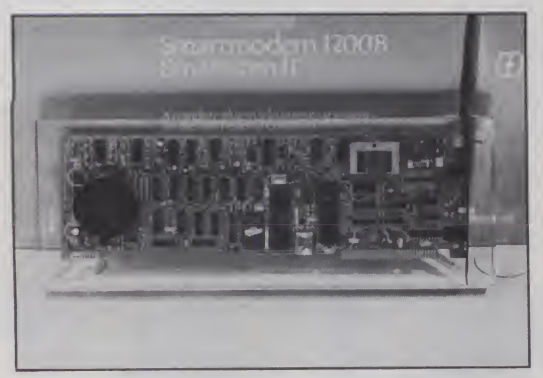
In keeping pace with the mass-storage trend, Non-Linear Systems has released a ten megabyte hard disk version of the Kaypro II. Called the Kaypro 10, the system features, in addition to the hard disk, full graphics capability and comes programmed with all of the Kaypro II's software packages (worth about $2500 if pur-



This keyboard attaches to the Brother HR-15 to make it a highly capable electronic typewriter. The low-profile keyboard sells for $199.



Quadram Corp. provided this "exploded" view of their Microfazer print buffer. The Microfazer installs between the printer and computer and frees the computer to do other work while the Microfazer feeds the printer..These devices are available with various buffer sizes and port configurations.



Hayes Microcomputer Products released a new 1200-baud internal modem for the IBM PC. This modem slides into one of the expansion slots of the PC. The $599 price includes the Hayes Smartcom II communications software. The Smartmodem 1200B sells for $599. Contact Hayes Microcomputer Products, 5923 Peachtree Industrial Blvd., Norcross, GA 30092.

The Quadram QuadLink gives the IBM PC the ability to work as an Apple II microcomputer. The QuadLink board can run a wide range of Apple II software while using the IBM PC's peripheral devices.

chased separately).

The Kaypro 10 costs $2795. For more details contact Non-Linear Systems, Inc., 533 Stevens Ave., Solana Beach, CA 92075.

Commodore Business Machines (1200 Wilson Drive, West Chester, PA 19380) unveiled its first portable computer, the Executive-64. The system weighs about 28 pounds and features 64K, a single built-in 170K disk drive and a six-inch monitor. The Executive-64 costs $995. (A dual drive version is available for $1195.)

Printer Wars

The war of the printers continues. Okidata seems to be in the lead with their new Microline 92 and 93 160 characters per second printers, but they have strong competition on every front.

For instance, Mannesmann Tally reduced the price of its dot printers. Its MT160 now sells for $698 for the data processing version and $798 for the version able to produce correspon-

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The H-100 is easy to build – the step-by-step Heathkit manual shows you how. And every step of the way, you have our pledge – "We won't let you fail." Help is as close as your phone, or the nearest Heathkit Electronic Center.†

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And the industry-standard S-100 card slots support memory expansion and additional peripheral devices, allowing your investment to grow.

High-capacity disk storage, too. The H-100's 5.25" floppy disk drive can store 320K bytes on a single disk. The computer also supports an optional second 5.25" and external 8" floppy disk drives. For maximum storage, an optional internal Winchester disk drive is also available.

For more information, circle the reader service number below. Better yet, visit your Heathkit Electronic Center for a demonstration!

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dence-quality text.

The Japanese firm Brother introduced the HR-15 daisy wheel printer. It produces perfect letter-quality print and has a list price of $599. It runs slowly at 13 cps, but it has some unique features. For $199 you can add a keyboard that turns the printer into an electronic typewriter, complete with an automatic correction capability. A tractor feed costs $149 and a cut-sheet feeder is $259.

The HR-15 looks like a significant challenge to the market position occupied by the Smith-Corona TP series of printers.

Graphics Battles And Software Integration

The next obvious battleground will be in graphics plotters. Hewlett-Packard has had the strong lead in this area for a long time, but it is being challenged by many manufacturers, including Amdek and Mannesmann Tally (which sells its Pixy 3 Micro Plotter for $795).

The hard disk vendors were both happy and sad over IBM's entry into their territory with the IBM PC XT. They were happy because IBM had legitimized the hard disk and sad because they did it at such a competitive price and with DOS 2.0 and a special RAM.

In the software world, we saw the continued trend toward integrated families of software. MicroPro introduced four new products, including PlanStar, a financial modeling tool, StarBurst, which links MicroSoft software together, WordStar 3.3 with better documentation and installation, and StarIndex, which allows WordStar to create a table of contents and an alphabetized index, among other features. MicroPro is at 33 San Pablo Ave., San Rafael, CA 94903.

Infoscope

Microstuf demonstrated its refined communications program, Crosstalk XVI, for MS DOS and the IBM PC. It also demonstrated a unique new data management and display program—Infoscope—for MS DOS (PC DOS). This is a new kind of program that allows you to have full access and power over a data file, regardless of its file format.

You can capture data from a dial-up utility or other bulletin board, and sort and arrange it with Infoscope. Infoscope lets you make sense out of otherwise cluttered data and text files.

The program is also unique in that it can expand its command language to include words you find easy to use. If you type a command incorrectly, it even finds a match and asks if that was what you meant to say.

Microstuf is located at 1845 The Exchange, Atlanta, GA 30339.

Hayes Microcomputer Products showed a new communications program for its IBM PC-integrated modem. SSM showed a prototype electronic message system, and VM Personal Computing released a low-cost electronic mail software package.

SuperSoft (1713 S. Neil St., PO Box 1628, Champaign, IL 61820) demonstrated VoiceDrive, a voice input system for its ScratchPad spreadsheet. The user can make spreadsheet inputs and calculations without ever touching the microcomputer's keyboard.■

Was It Worth It?

The spring Comdex computer show and the National Computer Conference (NCC) both lacked any surprising new releases.

We saw the continuation of some trends in the industry—more portable systems, more integrated software and more letter-quality printers—but except for a few programs (like Microstuf's Infoscope), we didn't see any new directions or big breakthroughs. What we did see was a change in the nature of the marketing and the size of competition.

The microcomputer industry has passed quickly through its adolescence and is in a transition to its young adult status. It has gained strength and stamina. It has grown confident and is acquiring sophistication. In the meantime, much of the simplicity and many of the

(continued on page 97)

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(from page 96)

joys of adolescence are being abandoned.

Micros Attract Attention

Only a few years ago, NCC relegated microcomputer manufacturers and dealers to a basement hall away from the "real" computers. This year, the big machines occupied quiet sections of vendors' booths while the crowds gathered around the microcomputers that flooded the hall.

There is a change, though. The small companies who were in the basement have grown to rival the traditional giants, while the giants have taken on some of the same characteristics as the once-small guys. The industry has become broader and heavier in the last year, instead of taller.

The buyers are changed, too. The jeans and T-shirts have become three-piece suits. Nuts-and-bolts technical talk is difficult to find and discussions of profit margins and markups are everywhere. The buyers and lookers at today's shows couldn't tell a RAM chip from a CPU if they found it in their soup.

It's hard to find a major computer manufacturer who does not offer a microcomputer. Digital Equipment, NCR, Honeywell, Wang and, of course, IBM, all offer capable microcomputer systems. Apple and Tandy have become Wall Street giants, and software companies are considered hot stock opportunities.

Are the small start-up firms gone? No—they're still there selling hardware—such as hard disk drives, network interfaces, and plotters—and they're still there selling software, but they have a much tougher course ahead of them.

Staying Alive

It takes a great deal more money to start a business and to stay in business now than it did just one year ago. The microcomputer buying market has grown in size and dropped in technical sophistication. It costs more to reach the buyers, and they take longer to shop. Competition is cutting prices to the bone and overhead is increasing as more sophisticated ads, stores and sales people are needed.

The higher start-up costs will bring more conservatism to the industry. We're going to see fewer exciting announcements coming out each month and more effort being made to let product lines mature and pay for themselves several times over before they are totally superseded. I still get about 30 press releases a month from various agencies, but now they usually detail new company financing plans or a change of executive officers rather than a new processor or printer.

I predict that this conservative level of activity will go on for about a year, then three things will happen to force some hardware changes.

The buyers and lookers at today's shows couldn't tell a RAM chip from a CPU if they found it in their soup.

The hardware changes will precipitate another evolution in software and we'll be off again on another cycle.

The first two forces that will cause hardware changes are at the chip level. The impact of the 256K RAM wars expected in late 1983 should be seen in hardware in early 1984.

The Forces of Hardware Change

The Japanese will be lined up against AT&T, Intel, Motorola and Texas Instruments to see who will win the greatest share of the 256K RAM market. In the process, the consumer should see even lower memory prices and greater use of RAM disk and memory partitioning. This also may cause the final end of the eight-bit processor as a central CPU. The eight-bit processor's limit of 64K of direct address space will probably be too restrictive on the next waves of application software.

The second force that will bring hardware changes in early 1984 is the availability of 32-bit processors. Speed of processing, rather than memory-addressing capability, will be the main advantage, but processor speed becomes more important as the price of RAM goes down and the size of RAM goes up.

The third force that will change microcomputers in 1984 will be regulatory. Almost everyone who has used a microcomputer at home knows that they are hostile to local television receivers. Microcomputers are great polluters of the radio frequency spectrum and they interfere with television and critical radio sevices such as police, fire and air traffic control.

The Federal Communications Commission has been lenient on this pollution so far, but the problems will multiply as the number of microcomputers in the environment goes up. The FCC is expected to enforce tough new radio frequency emission standards starting in November 1983.

There will probably be exceptions, "grandfathering" and appeals, but it's a sure bet that most of the microcomputers we know and love today will not meet the new standards. The FCC is right in doing this. My IBM PC shouldn't wipe out TV channels 2 and 4 the way it does, but we'll have to pay for the changes.

Reducing radio frequency energy means better design and better shielding. It means more material and more manufacturing time. All of this means more cost. The added cost can be very little when it is spread over thousands of systems, but it can be a big factor for start-up companies and those companies who are not getting their desired corporate rate of return from their microcomputer investments.

No Small Change

The Comdex and NCC computer shows did bring us some new hardware and software, but they probably served better to show how the industry has changed in the last year and what changes will be coming in the next.

The year 1983 is one of transition. The year 1984 will be one of significant, though conservative, change.■ *F.D.*

Roll Your Own!

When it comes to saving a few bucks, there's no one more ingenious than the microcomputer hobbyist. Here's a seven-cent solution to a five-dollar problem that will keep the good times rolling with your Epson HX-20.

By Doan Hansen

Epson's HX-20, despite its usability and versatility, has a singular disadvantage: the paper for the built-in printer. The refills are a) too expensive (usually around $4.95) and b) never in stock.

After several hours of intensive lab work and an exhaustive combing of the literature, I discovered that HX-20 printer paper is close in width to the 39¢ roll of 2¼-inch adding machine paper. Even so, my research team was unable to insert the three-inch-diameter roll of adding machine paper into the one-inch-diameter HX-20 paper storage compartment.

Until work in this area proves successful (don't hold your breath), two alternative methods we've developed will provide ample printer paper.

Here are two methods for providing ample printer paper for the Epson HX-20

Method 1

Using a coat hanger, construct the apparatus shown in Fig. 1. I suggest that only an all-wire coat hanger be used for this purpose, since plastic hangers break if you try to bend them and wooden hangers splinter under similar circumstances. The wire coat hanger allows you to feed the larger but less-expensive adding machine paper into the printer from outside the paper storage compartment.

Method 2

This method will appeal particularly to computer-using members of the counterculture.

From the roll of adding machine paper, tear off approximately six feet (this is roughly 14 floppy disks laid end-to-end). Roll the paper into a tight coil (see Fig. 2). Some users feel that this works best when the paper is rolled around a lead pencil.

Regardless of the manner of rolling, place the tightly wound paper coil into the paper chamber, insert the end and close the lid.

It Makes Cents

I hope that these two methods will be of benefit to HX-20 users worldwide. Since approximately six Epson-sized rolls can be made from one 39¢ adding machine roll, the equivalent cost, using adding machine paper, is roughly seven cents per roll.

It's a pleasure to be a part of the current breakneck pace of microcomputer research and development. It's progress through independent research such as this (unfunded no less) that constantly injects new, creative blood into the industry. Move over, Wozniak.■

Fig. 1. Coat-hanger method for dispensing adding machine paper to the Epson HX-20 printer.

Fig. 2. For portable use, adding machine paper can be rerolled to fit into the HX-20 paper storage compartment.

Address correspondence to Doan Hansen, c/o The School of Public Health, University of Michigan, Ann Arbor, MI 48109.

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—Lose data on a glitched disk? If a glitched disk makes it impossible to call up a long word processing text, **POWER!** can fix the glitch. This means you may have to retype only a couple of sentences instead of losing 20 pages of text.

—Trouble with "bargain" disks? POWER!'s disk testing function gathers any bad sectors of the disk into a special file so that CP/M thinks those parts of the disk are already used and never attempts to write to them. The rest of the disk is then safe to use.

—CP/M scrolls too fast through text files? POWER! spools through files page by page, file by file, or line by line with instant halt by touching the space bar.

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—Need to change memory? POWER! searches, displays and lets you change memory wherever you want. You can even automatically run software anywhere in memory. And you can inter-mix your search with as many wild card jokers as you need to find, for instance, all occurrences of "Sam Jones" and "Sid James" just by typing "S??J??". And **POWER!** also lets you read or write to any sector or track very simply.

—Changing disks? You can forget the ubiquitous Control C to change disks. **POWER!** can do it for you automatically. And **POWER!** doesn't require a system disk in any drive, so Drive A is open for use, when **POWER!** is in control of CP/M.

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Buyer's Guide To Systems Under $1000

Today's microcomputer market is flooded with a seemingly endless stream of systems—varying in memory, disk-drive capacity, screen display size . . ., but which one should you buy?* Microcomputing *can help you decide. This month's buyer's guide, the first of a series on microcomputer systems, focuses on systems under $1000. It breaks each micro down into 11 categories, so you can compare the capabilities most important to you. Next month,* Microcomputing *will cover systems in the $1000 to $2500 range.

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price*	Micro-processor	Bit Configuration
Commodore Business Machines, Inc. 1200 Wilson Drive West Chester, PA 19380	VIC-20	18×13×6	10 lbs.	199.95	6502A	8-Bit
Video Technology (U.S.), Inc. 2633 Greenleaf Ave. Elk Grove Village, IL 60007	VZ200 Color PC	2×11½×6¼	5 lbs.	99.00	6502	8-Bit
Timex Computer Corp. PO Box 2655 Waterbury, CT 06725	Timex-Sinclair 1000 Timex-Sinclair 2000	6×6½×1½ 9×5½×1¼	12 oz. 20 oz.	49.95 199.95	Z-80A Z-80A	8-Bit 8-Bit
Mattel Electronics 5150 Rosecrans Ave. Hawthorne, CA 90250	Mattel Aquarius	13×6×2	1½ lbs.	200.00	Z-80A	8-Bit
Sharp Electronics Corp. 10 Sharp Plaza Paramus, NJ 07652	Sharp PC-1500	7¾×1×3⅜	.8 lbs.	220.00	CMOS	8-Bit
Texas Instruments Data Systems Group PO Box 402430 H-651 Dallas, TX 75240	TI CC-40	9½×5¾×1	22 oz.	249.95	TMS-9995	16-Bit
Commodore Business Machines, Inc. 1200 Wilson Drive West Chester, PA 19380	C-64	18×13×6	10 lbs.	499.95	6570	8-Bit
Atari Home Computer Division PO Box 50047 San Jose, CA 95150	Atari 400	13½×11½×4½	5¾ lbs.	299.00	6502B	8-Bit
Spectra Video, Inc. 39 West 37th St. New York, NY 10018	SV318	3×8⅝×16	3¾ lbs.	299.00	Z-80A	8-Bit

***Suggested retail price**

Compiled by Michele Christian

†The Timex-Sinclair 2000 offers 16K and color graphics for $199.95.

†Mattel's Aquarius comes of age.

†The Commodore-64 features the power of 64K and a price tag of $499.95.

†Texas Instruments CC-40 weighs just 22 ounces.

†The SV318, from Spectra Video, Inc., has memory capacity of 144K.

Memory Capacity	Disk Drive Capacity	Disk Drive Size	Operating System	Hard Disk	Screen Display	Color	Interface
5K-32K RAM 20K ROM	170K	5¼"	Basic 2.0	N/A	22×23	Y	RS-232-standard
4K-64K RAM 12K optional	Available '84		Microsoft	Available '84	N/A	Y	RS-232-standard Parallel-optional
1K-16K RAM 8K ROM	N/A	N/A	Basic	N/A	32×24	N	Parallel
16K RAM 16K ROM	100K per drive	3"	Basic	N/A	32×24	Y	Parallel-standard RS-232-optional
4K RAM 8K ROM	Available late '83		CP/M Late '83	N/A	40×24	Y	RS-232-standard
3.5K-7.5K RAM 16K ROM	N/A	N/A	PC-1500	N/A	26 Char. LCD	N	Parallel, RS-232-standard
6K-16K RAM 34K ROM	N/A	N/A	TI Basic	N/A	31 Char. LCD	N	RS-232-standard
64K RAM up to 64K ROM	170K	5¼"	Basic 2.0	N/A	40×25	Y	RS-232-standard
16K RAM 10K ROM	88K	5¼"	Atari DOS/FMS	N/A	40×24	Y	Parallel-standard
32K-144K RAM 32K-96K ROM	170K Formatted	5¼"	Basic, CP/M	N/A	40×24 LCD in ROM	Y	Parallel-optional

N/A = Not available

↑The 64K Atari 1200 XL.

←Personal Microcomputers' EPS-80.

The Atari 800.→

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price*	Micro-processor	Bit Configuration
Quasar 9401 W. Grand Ave. Franklin Park, IL 60131	Quasar HHC	3¾ × 8⅞ × 1¼	14 oz.	329.00	6502	8-Bit
Panasonic Corp. 1 Panasonic Way Secaucus, NJ 07094	Panasonic JR-200	13½ × 8	5½ lbs.	349.95	6802	8-Bit
Texas Instruments Data Systems Group PO Box 402430 H-651 Dallas, TX 75240	TI 99/4A	10¼ × 11 × 2¾	less than 5 lbs.	100.00	TMS 9900	16-Bit
Olympia Route 22 N. and Orr Drive Somerville, NJ 08876	OL-H004	9 × 3¾ × 1¼	21 oz.	380.00	6502	8-Bit
Multi-Tech Electronics 195 W. El Camino Real Sunnyvale, CA 94036	Micro Professor II	7 × 10 × 1	6 lbs.	399.00	R6502	8-Bit
Tandy Corp. Radio Shack 1 Tandy Center Fort Worth, TX 76102	TRS-80 CoCo	3½ × 13¾ × 14¾	Less than 50 lbs.	399.95	6809E	8-Bit
Grundy Business Systems, Ltd. Somerset Road, Teddington Middlesex TW11 8TD, England	New Brain AD	11 × 6¼ × 2	3.3 lbs.	470.00	Z-80A	8-Bit
Personal Microcomputers, Inc. 475 Ellis St. Mountain View, CA 94043	PMC 80/81	4¾ × 21¼ × 15	19 lbs.	595.00	Z-80	8-Bit
Atari Home Computer Division PO Box 50047 San Jose, CA 95150	Atari 800	16 × 12½ × 4½	9¾ lbs.	649.00	6502B	8-Bit
Syntron Corp. 39 W. 300 North Provo, UT 84601	Syscom II	15 × 18 × 5	17 lbs.	695.00	6502	8-Bit
Personal Microcomputers, Inc. 475 Ellis St. Mountain View, CA 94043	EPS-80	21¼ × 15 × 4¾	20 lbs.	795.00	Z-80	8-Bit
Epson 3415 Kashiwa St. Torrance, CA 90505	Epson HX-20	1¾ × 11⅜ × 8½	4 lbs.	795.00	6301	8-Bit
Atari Home Computer Division PO Box 50047 San Jose, CA 95150	Atari 1200 XL	2¾ × 14⅞ × 12⅝	6⅛ lbs.	899.00	6502B	8-Bit
Lobo Systems, Inc. 358 S. Fairview Ave. Goleta, CA 93117	Lobo MAX-80	3 × 18¼	19 lbs.	945.00	Z-80B	8-Bit

*Suggested retail price

†The notebook-size Epson HX-20 features a 328K disk-drive capacity.

†The Quasar HHC measures $3^3/_4 \times 8^7/_8 \times 1^1/_4$ and wieghs a mere 14 ounces.

The 3½-pound Tandy Model 100 is menu-→ driven with internal firmware.

Memory Capacity	Disk Drive Capacity	Disk Drive Size	Operating System	Hard Disk	Screen Display	Color	Interface
2K RAM 16K ROM	N/A	N/A	N/A	N/A	32 Char. LCD	Y	RS-232-optional
32K RAM 16K ROM	N/A	N/A	Basic	N/A	32×24 not included	Y	Parallel, standard RS-232-optional
16K-32K RAM 26K ROM	256K	5¼"	NMOS	N/A	32×24	Y	RS-232-standard
4K-52K RAM 64K ROM	N/A	N/A	N/A	N/A	not included	Y	RS-232-optional
64K RAM 16K ROM	190K per drive	5¼"	Basic	N/A	40×24	Y	Centronics
4K-64K RAM 8K ROM	161K	5¼"	TRS DOS	N/A	32×16	Y	RS-232, standard
32K-2M RAM 5K ROM	N/A	N/A	New Brain OS	Optional	not included	N	RS-232-standard
16K-48K RAM 14K ROM	102K	5¼"	TRS DOS	5¼" 5-40 MB	64×16 12" Monitor	N	RS-232-optional
16K-48K RAM 10K ROM	88K	5¼"	Atari DOS/FMS	N/A	40×24	Y	Parallel-standard
48K-64K RAM 12K ROM	140K	5¼"	Apple DOS	5¼" or 8" 10-40 MB	40×24	Y	RS-232-standard Parallel-optional
48K RAM 20K ROM	102K	5¼"	TRS DOS optional	N/A	64×16	N	Parallel-standard RS-232-optional
16K-32K RAM 32K ROM	320K	5¼"	Microsoft Basic	N/A	20 Char.× 4 Line LCD	N	RS-232-standard
64K RAM 24K ROM	88K	5¼"	Atari DOS/FMS	N/A	40×24	Y	RS-232-standard
64K-128K RAM	Varies	8" and 5¼" Available	CP/M & LDOS	Capacity varies 5¼" or 8"	80×24	N	Parallel-standard

N/A = Not available

Manufacturer Name/Address	Model	Dimensions (in inches)	Weight	Price*	Micro-processor	Bit Configuration
Nabu Manufacturing Corp. 1051 Baxter Road Ottawa, Ontario, Canada K2C 3P2	Nabu PC	3½ × 18½	12 lbs.	975.00	Z-80A	8-Bit
NEC Home Electronics Personal Computer Division 1401 Estes Ave. Elk Grove, IL 60007	NEC PC 8001 A	16⅞ × 10¼ × 3⅛	14 lbs.	995.00	Z-80A Compatible	8-Bit
Tandy Corp. Radio Shack 1 Tandy Center Fort Worth, TX 76102	Model 100	11¾ × 8½ × 1⅞	3½ lbs.	999.00	80C85	8-Bit
	TRS-80 III	12½ × 18¾ × 21½	Less than 50 lbs.	999.00	Z-80	8-Bit

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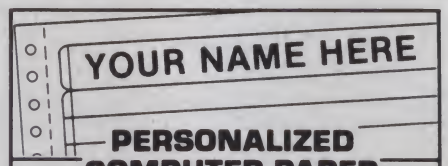

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Memory Capacity	Disk Drive Capacity	Size	Operating System	Hard Disk	Screen Display	Color	Interface
80K RAM 4K ROM	Varies	5¼"	CP/M	N/A	40×24	Y	RS-232-optional
16K-32K RAM 24K ROM	156K per drive	5¼"	CP/M	N/A	80×25 12" Monitor	Y	Parallel-standard RS-232-optional
8K-32K RAM 14K ROM	N/A	N/A	Menu Driven Int. Firmware	N/A	Built-in LCD 40×8	N	RS-232 or Parallel
16K-48K RAM 14K ROM	184K	5¼"	TRS DOS	Available 5-20 MB	Built-in 9" 64×16	N	Parallel-standard

N/A = Not available

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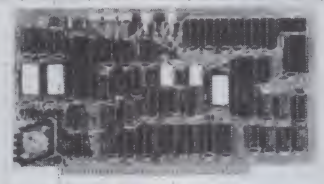

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Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents capsulized software reviews from various computer-related publications.

Synthy-64

System Requirements: Commodore-64; 64K RAM; 1541 single disk drive.
Manufacturer: Abacus Software, PO Box 7211, Grand Rapids, MI 49510
Price: $35
Comments: Synthy-64, according to the review, is a program that overcomes the slowness of Commodore's Basic interpreter and lets you quickly and easily code music for the excellent Commodore sound interface device.

The manual could be more precise, but the review concludes that "If you want to learn about sound synthesis by experiment, without drudgery, and create some decent compositions, then you will like Synthy-64." Reader Service number 401

(Reviewed in InfoWorld, *May 16, 1983)*

NECPrint

System Requirements: IBM PC; 64K RAM; one or two disk drives
Manufacturer: Aegis Systems, 202 West Bennett St., Saline, MI 48176
Price: $25
Comments: NECPrint, according to the review, "fills a software void between the PC and the NEC 8023A printer. . . . NECPrint simplifies your printing tasks with a menu of printer set-up and text formatting options."

"If you're concerned," concludes the review, "only with choosing type styles, numbering pages or setting margins, just load Basic, run NECPrint, make your choices from NECPrint's menu and print your file. It's that easy." Reader Service number 402

(Reviewed in Softalk for the IBM Personal Computer, *January 1983)*

Executive Suite

System Requirements: IBM PC; 64K RAM; one or two disk drives
Manufacturer: Armonk, 610 Newport Center Drive, Suite 955, Newport Beach, CA 92660
Price: $39.95
Comments: "Executive Suite," says the review, "gives you the opportunity to fight your way up the corporate ladder rather than thinking your way past dragons . . . you'll have to keep your wits about you and make tough decisions that will affect your business and personal life as you vie for higher paying positions."

Unlike *most* adventure games, states the review, you make your action choices from a series of multiple-choice menus. "Be prepared for fun and surprises when playing Executive Suite," concludes the review, "and remember to bring your towel." Reader Service number 403

(Reviewed in Softalk for the IBM Personal Computer, *January 1983)*

Legionnaire

System Requirements: Atari 400/800; 16K RAM; disk or cassette; joystick, 410 recorder or disk drive
Manufacturer: Avalon Hill Microcomputer Games, Inc., 4517 Harford Road, Baltimore, MD 21214
Price: $35
Comments: The review says that "Legionnaire is a game you must learn and think about while you play." You are Caesar in Gaul, subduing barbarian tribes with always outnumbered forces.

"Legionnaire," states the review, "takes computer-game design into new territory . . . its complex elegance contrasts markedly with the instant bedazzlement that sells so many of the mindless shoot-'em-ups now cluttering the market." Reader Service number 404

(Reviewed in InfoWorld, *February 14, 1983)*

Molec

System Requirements: Apple II Plus; DOS 3.3; 64K RAM; 16K RAM card or Apple Language Card; one disk drive
Manufacturer: Cambridge Development Laboratory, 36 Pleasant St., Watertown, MA 02172
Price: $150
Comments: This program, according to the review, is designed to assist in the study of molecular structure. A single student may use it, or, says the review, "Molec displays large enough three-dimensional molecules on the computer's screen for an average-size class to see."

"You can draw and store your own molecules with this program," states the review, but "creating all but the simplest molecules is a real chore. The hard part is calculating the x, y and z coordinates of each atomic nucleus." Once these trigonometric calculations are done, the entering and editing of the data is easy. Reader Service number 405

(Reviewed in InfoWorld, *February 14, 1983)*

VIXEL

System Requirements: Commodore VIC-20; joystick; color monitor recommended
Manufacturer: Code Works, 5266 Hollister, Suite 224, Santa Barbara, CA 93111
Price: $12.95 per tape
Comments: According to the review, VIXEL is a cassette tape magazine in three volumes, each volume containing three programs. There are seven games and two graphics utilities in all.

The Superfont graphics utility, says the review, "allows you to program special characters by moving the cursor around a screen grid . . . the program is intended as a graphics aid for VIC programmers." The review concludes that "If you want some hassle-free games for the VIC, it's a good value." Reader Service number 406

(Reviewed in InfoWorld, *May 16, 1983)*

Palantir

System Requirements: 8080-, Z-80-, or 8086-based system; CP/M, MP/M I or II (with patches) or Turbo-DOS; minimum of 56K RAM; two 5¼-inch or eight-inch disk drives
Manufacturer: Designer Software, 3400 Montrose, Suite 718, Houston, TX 77006
Price: $450
Comments: As a word processing system, "Palantir has more than its share of features," says the review, "including many of the 'most desired' functions and is reasonably easy to learn."

Stating that "Palantir fulfills its intended purpose . . . well," the review concludes that the program "should be considered a serious candidate if you're looking for a good word processing system. The price is higher than that of most other . . . systems, but Palantir includes, in a single package, features that you have to pay extra for in other packages." Reader Service number 407

(Reviewed in InfoWorld, *April 25, 1983)*

Madame Shepp's Tarot

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; at least one disk drive
Manufacturer: G.Y.S.T., 540 Midvale Way, Mill Valley, CA 94941
Price: $37.50
Comments: The review says that "Madame Shepp has done an excellent job of adapting traditional tarot readings to the microcomputer. Her readings are based on the Rider-Waite tarot deck and every attempt is made to individualize each reading."

Although hi-res pictures would improve the effect, according to the review, "This program is not designed as a game, but as a serious attempt to provide computerized tarot readings . . . [the program] is refreshingly delightful and intriguing, even for nonbelievers." Reader Service number 409

(Reviewed in Softalk, *February 1983)*

Ken Uston's Professional Blackjack

System Requirements: IBM PC; 64K RAM; one or two disk drives
Manufacturer: Intelligent Statements, Box 2602, Chapel Hill, NC 27514
Price: $89.95
Comments: "This is a complete toolkit for the serious twenty-one player," says the review. "The program teaches and coaches three levels of card-counting strategy."

The documentation, according to the review, is a condensation of Uston's book, *Million Dollar Blackjack*, and both text and color charts "are distinct improvements over the originals; some players may find the charts alone to be worth the price of the program." Reader Service number 410

(Reviewed in Softalk for the IBM Personal Computer, *January 1983)*

Easyproof Spelling Checker

System Requirements: IBM PC; PC-DOS; 64K RAM minimum, 128K preferred; at least one, preferably two, disk drives
Manufacturer: Nordell Data Systems, 3400 Wilshire Blvd., PO Box 70127, Los Angeles, CA 90010
Price: $79.95
Comments: Easyproof is a spelling checker, according to the review, that scans your text files and notes any words that are not currently in the program dictionary files. Misspellings are, of course, noted.

The review says the program is easy to install and use, and concludes that "Programs of this type can be a wonderful addition to any software library that includes large numbers of text-related processing and filing programs." Reader Service number 412

(Reviewed in InfoWorld, *March 21, 1983)*

IBM Pascal and Pascal MT + 86

System Requirements: IBM PC with two disk drives for both programs; IBM PC-DOS and 128K RAM for IBM Pascal; CP/M-86 and 192K RAM for Pascal MT + 86
Manufacturers: IBM Pascal manufactured by Microsoft, 10700 Northup Way, Bellevue, WA 98004; *Pascal MT + 86* manufactured by Digital Research, Inc., PO Box 579, Pacific Grove, CA 93950
Prices: IBM Pascal, $300; Pascal MT + 86, $400
Comments: The review compares these two Pascal compilers. According to the review, both programs compiled the 50 Pascal programs fed to them, with IBM Pascal performing more nearly as expected. The Digital compiler proved better with numeric precision, its compiling time was faster and its command files less bulky than the Microsoft program.

The review states that IBM Pascal has some advantage in error handling and documentation, although the latter was intensely technical. The reviewer concludes that "The IBM Pascal compiler is a solid product," with reliability and a close match to the standard language, whereas "I liked the speed of Pascal MT + 86 and its excellent numeric precision . . . I would be willing to base a major programming project on either compiler." Reader Service numbers 408 and 411

(Reviewed in InfoWorld, *March 21, 1983)*

The Norton Utilities

System Requirements: IBM PC; 64K RAM; one or two disk drives
Manufacturer: Peter Norton, 1716 Main St., Venice, CA 90291
Price: $80 for the complete package
Comments: According to the review, The Norton Utilities comprise four main programs—Disklook, Secmod, Filehide and Unerase—written in IBM Pascal, which makes execution very fast. Disklook displays a disk's directory and shows for each file its size in bytes, number of sectors used, time and date created and starting track and sector numbers. "Filehide," says the review, "allows you to control hidden and system file attributes, setting them on or off at will."

Secmod's function, states the review, is to modify data on specified disk sectors, while Unerase recovers whatever is recoverable from accidentally erased files. Although the programs can be purchased individually, the complete package brings the bonus of ten additional little programs that sort, print and perform other file operations. Reader Service number 413

(Reviewed in Softalk for the IBM Personal Computer, *January 1983)*

Cache/Q

System Requirements: CP/M 2.2; 32K RAM; one disk drive
Manufacturer: Techne Software Corp., 3685 Mt. Diablo, Suite 130, Lafayette, CA 94549
Price: $195
Comments: Cache/Q is a disk-buffering enhancement for CP/M. According to the review, the program speeds up disk work with CP/M by storing disk sectors in a cache in RAM. "If subsequently you want to read them," says the review, "Cache/Q fetches them directly from memory, bypassing the disk access. CP/M is appropriately fooled into ignoring the change."

Stating that the documentation is extensive and clear, the review concludes that "Cache/Q is a professional, useful, easy-to-use product. I would recommend it to anyone who wants to speed up his CP/M applications and work environment without having to invest in a lot of new hardware." Reader Service number 419

(Reviewed in InfoWorld, *February 14, 1983)*

Manual Maker

System Requirements: Z-80 system; CP/M; 56K RAM; dual disk drives (the software comes on an eight-inch disk); printer and word processor
Manufacturer: PromptDoc, Inc., 833 West Colorado Ave., Colorado Springs, CO 80905
Price: $245
Comments: "Manual Maker," says the review, "is intended to simplify and speed up the process of document creation." The program performs well, states the review, and the documentation is professional and clear.

"In a business environment," the review concludes, "with five to 25 employees involved in a constant documentation effort, Manual Maker might serve its users well." Reader Service number 414

(Reviewed in InfoWorld, *March 14, 1983)*

List Handler

System Requirements: Apple II or II Plus; 48K RAM; ROM Applesoft; at least one disk drive
Manufacturer: Silicon Valley Systems, 1625 El Camino Real, Belmont, CA 94002
Price: $89.95
Comments: In addition to List Handler's main function of managing large lists of information, the review states that "the program allows you to create customized form letters based on the content of a list file." According to the review, the program is easy to use, with an excellent manual and helpful on-screen menus.

"List Handler is a bargain," concludes the review, "especially in view of the form letter capability and the large and flexible record and field sizes allowed." Reader Service number 415

(Reviewed in Softalk, *February 1983)*

Filewhiz

System Requirements: Apple II, one disk drive; printer optional
Manufacturer: Softhouse, PO Box 6383, Rochester, MN 55903
Price: $79
Comments: According to the review, "Filewhiz provides a simple, effective and inexpensive way to store, manipulate and retrieve data." It is easy to learn, states the review, and is thus a good system for beginners in database management.

"While Filewhiz may not be the ultimate database manager," concludes the review, "it does offer a reasonably good balance between low price and useful performance." Reader Service number 416

(Reviewed in Popular Computing, *April 1983)*

The Optimizer

System Requirements: IBM PC; 48K RAM; one or two disk drives
Manufacturer: Supersoft, Box 1628, Champaign, IL 61820
Price: $200
Comments: "This program," states the review, "can help you and your firm find optimal solutions to business and manufacturing problems." Although internal error trapping is poor and data entry difficult, according to the review, "File control is good . . ." and "The Optimizer's algorithms are robust. Neither trivial errors nor mathematical degeneracies will faze it."

The program requires only 48K, but is limited in its decision variables and constraints, concludes the review. "These limitations may be appropriate for small, less powerful computers. They aren't adequate when the PC's extended memory capacity is taken into consideration." Reader Service number 417

(Reviewed in Softalk for the IBM Personal Computer, *January 1983)*

The Landlord

System Requirements: IBM PC; monochrome adapter; 80-column parallel printer; 128K RAM; two disk drives; the file BASRUN.EXE (on the library disk of the IBM Basic Compiler, provided separately for $30 if you don't already have it)
Manufacturer: Systems Plus, Inc., 1120 San Antonio Road, Palo Alto, CA 94303
Price: $595
Comments: "The Landlord," says the review, "handles the accounting and record-keeping activities involved in managing income-producing property. The program consists of two systems: a financial package and a records-management package."

According to the review, the program is easy to operate, even for computer novices, and "the documentation deserves applause for its completeness and readability." Reader Service number 418

(Reviewed in PC World, *May 1983)*

VisiCalc Advanced Version

System Requirements: Apple III; SOS (Sophisticated Operating System); 128K RAM; one 5¼-inch floppy-disk drive plus one additional drive
Manufacturer: VisiCorp, 2895 Zanker Road, San Jose, CA 95134
Price: $400
Comments: VisiCalc Advanced Version, according to the review, adds many features to the original VisiCalc that put it on a par with more recent leading spreadsheets. "For many accountants," says the review, "the most gratifying improvement will be the ability to easily consolidate many worksheets to create one unified plan."

With a clear and businesslike manual, VisiCalc Advanced is, concludes the review, "an excellent product, worth every penny. If its features are the ones you're looking for, you'll be absolutely delighted with it." Reader Service number 420

(Reviewed in InfoWorld, *March 21, 1983)*

Target Plannercalc

System Requirements: Any CP/M (version 2.2)-based computer
Manufacturer: Comshare Target Software, 1935 Cliff Valley Way, Atlanta, GA 30329
Price: $99
Comments: The review praises Target Plannercalc as a spreadsheet program, saying "Both its ease of use and its relatively low price make this program an attractive and very competitive alternative to any of the other popular electronic-spreadsheet programs."

Despite reservations about skimpy documentation, the review concludes: "If it were twice or three times the price, it would still be an effective software offering." Reader Service number 421

(Reviewed in Popular Computing, *April 1983)*

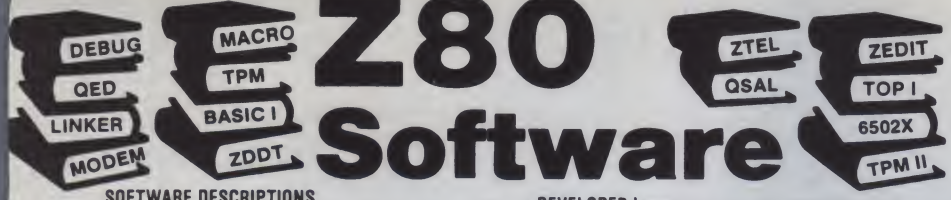
InfoWorld, published by Popular Computing, Inc., 375 Cochituate Road, Box 880, Framingham, MA 01701.

PC World, published by PC World Communications, Inc., 555 DeHaro St., San Francisco, CA 94107.

Popular Computing, published by BYTE Publications, Inc., 70 Main St., Peterborough, NH 03458.

Softalk and *Softalk for the IBM Personal Computer*, 11160 McCormick St., North Hollywood, CA 91601.

Table. Addresses of the magazines publishing the software reviews digested in this department.



Z80 Software

SOFTWARE DESCRIPTIONS

TPM (TPM I) - $80 A Z80 only operating system which is capable of running CP/M programs. Includes many features not found in CP/M such as independent disk directory partitioning for up to 255 user partitions, space, time and version commands, date and time, create FCB, chain program, direct disk I/O, abbreviated commands and more! Available for North Star (either single or double density), TRS—80 Model I (offset 4200H) or II, Versafloppy I, or Tarbell I.

TPM-II - $125 An expanded version of TPM which is fully CP/M 2.2 compatible but still retains the extra features our customers have come to depend on. This version is super FAST. Extended density capability allows over 600K per side on an 8" disk. Available preconfigured for Versafloppy II (8" or 5"), Epson QX-10, Osborne II or TRS-80 Model II.

CONFIGURATOR I

This package provides all the necessary programs for customizing TPM for a floppy controller which we do not support. We suggest ordering this on single density (8SD).
Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE (SFREE), MACRO II ($100), LINKER ($80), DEBUG I ($80), QED ($150), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$815 Value **NOW $250**

CONFIGURATOR II

Includes: TPM-II ($125), Sample PIOS (BIOS) SOURCE (SFREE), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QSAL ($200), QED ($150), ZTEL ($80), TOP II ($100), BUSINESS BASIC ($200) and MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1485 Value **NOW $400**

MODEL I PROGRAMMER

This package is only for the TRS-80 Model I. Note: These are the ONLY CDL programs available for the Model I. It includes: TPM I ($80), BUSINESS BASIC ($200), MACRO I ($80), DEBUG I ($80), ZDDT ($40), ZTEL ($80), TOP I ($80) and MODEM ($40)
$680 Value **NOW $175**

MODEL II PROGRAMMER

This package is only for the TRS-80 Model II. It includes: TPM-II ($125), BUSINESS BASIC ($200), MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), QED ($150), ZTEL ($80), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM ($40), MODEM SOURCE ($40) and DISASSEMBLER ($80)
$1445 Value **NOW $375**

BASIC I - $50, a 12K+ basic interpreter with 7 digit precision

BASIC II - $100. A 12 digit precision version of Basic I

BUSINESS BASIC - $200. A full disk extended basic with random or sequential disk file handling and 12 digit precision (even for TRIG functions). Also includes PRIVACY command to protect source code, fixed and variable record lengths, simultaneous access to multiple disk files, global editing, and more!

ACCOUNTING PACKAGE - $300. Written in Business Basic. Includes General Ledger, Accounts Receivable/Payable, and Payroll. Set up for Hazeltine 1500 terminal. Minor modifications needed for other terminals. Provided in unprotected source form

MACRO I - $80. A Z80/8080 assembler which uses CDL/TDL mnemonics. Handles MACROs and generates relocateable code. Includes 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical ops, local and global symbols, linkable module generation, and more!

MACRO II - $100. An improved version of Macro I with expanded linking capabilities and more listing options. Also internal code has been greatly improved for faster more reliable operation

MACRO III - $150. An enchanced version of Macro II. Internal buffers have been increased to achieve a significant improvement in speed of assembly. Additional features include line numbers, cross reference, compressed PRN files, form feeds, page parity, additional pseudo-ops, internal setting of time and date, and expanded assembly-time data entry

DEVELOPER I

Includes: MACRO I ($80), DEBUG I ($80), ZEDIT ($50), TOP I ($80), BASIC I ($50) and BASIC II ($100)
$440 Value **NOW $150**

DEVELOPER II

Includes: MACRO II ($100), MACRO III ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), BUSINESS BASIC ($200), QED ($150), TOP II ($100), ZDDT ($40), ZAPPLE SOURCE ($80), MODEM SOURCE ($40), ZTEL ($80), and DISASSEMBLER ($80).
$1280 Value **NOW $350**

DEVELOPER III

Includes: QSAL ($200), QED ($150), BUSINESS BASIC ($200), ZTEL ($80) and TOP II ($100)
$730 Value **NOW $300**

COMBO

Includes: DEVELOPER II ($1280), ACCOUNTING PACKAGE ($300), QSAL ($200) and 6502X ($150)
$1930 Value **NOW $500**

LINKER - $80. A linking loader for handling the linkable modules created by the above assemblers

DEBUG I - $80. A tool for debugging Z80 or 8080 code. Disassembles to CDL/TDL mnemonics compatible with above assemblers. Traces code even through ROM. Commands include Calculate, Display, Examine, Fill, Goto, List, Mode, Open File, Put, Set Wait, Trace, and Search

DEBUG II - $100. A superset of Debug I. Adds Instruction Interpreter, Radix change, Set Trap/Conditional display, Trace options, and Zap FCB

6502X - $150. A 6502 cross assembler. Runs on the Z80 but assembles 6502 instructions into 6502 object code! Similar features as our Macro assemblers

QSAL - $200. A SUPER FAST Z80 assembler. Up to 10 times faster than conventional assemblers. Directly generates code into memory in one pass but also to offset for execution in its own memory space. Pascal like structures: repeat, until, if, then, else, while, do, begin, end, case, of. Multiple statements per line, special register handling expressions, long symbol names, auto and modular assembly, and more! This one uses ZILOG Mnemonics

QED - $150. A screen editor which is both FAST and easy to learn. Commands include block delete, copy, and move to a named file or within text, repeat previous command, change, locate, find at start of line, and numerous cursor and window movement functions. Works with any CRT having clear screen, addressable cursor, clear to end of line, clear to end of screen, and 80X24.

ZTEL - $80. An extensive text editing language and editor modelled after DEC's TECO

ZEDIT - $50. A mini text editor. Character/line oriented. Works well with hardcopy terminals and is easy to use. Includes macro command capability

TOP I - $80. A Text Output Processor for formatting manuals, documents, etc. Interprets commands which are entered into the text by an editor. Commands include justify, page number, heading, subheading, centering, and more

TOP II - $100. A superset of TOP I. Adds: embedded control characters in the file, page at a time printing, selected portion printing, include/merge files, form feed/CRLF option for paging, instant start up, and final page ejection

ZDDT - $40. This is the disk version of our famous Zapple monitor. It will also load hex and relocatable files

ZAPPLE SOURCE - $80. This is the source to the SMB ROM version of our famous Zapple monitor. It can be used to create your own custom version or as an example of the features of our assemblers. Must be assembled using one of our assemblers

MODEM - A communication program for file transfer between systems or using a system as a terminal. Based on the user group version but modified to work with our SMB board or TRS-80 Models I or II. You must specify which version you want.

MODEM SOURCE - $40. For making your own custom version. Requires one of our Macro Assemblers

DISASSEMBLER - $80. Does bulk disassembly of object files creating source files which can be assembled by one of our assemblers

HARDWARE

S-100 — SMB II Bare Board $50. "System Monitor Board" for S-100 systems. 2 serial ports, 2 parallel ports, cassette interface, 4K memory (ROM: 2708 EPROM, 2114 RAM), and power on jump. When used with Zapple ROM below, it makes putting a S-100 system together a snap.
Zapple ROM $35. Properly initializes SMB I/II hardware, provides a powerful debug monitor.

IBM PC — Big Blue Z80 board $595. Add Z80 capability to your IBM Personal Computer. Runs CP/M programs but does not require CP/M or TPM. Complete with Z80 CPU, 64K add on memory, serial port, parallel port, time and date clock with battery backup, hard disk interface, and software to attach to PC DOS and transfer programs. Mfr'd by QCS
50% Discount on all CDL software ordered at the same time as a Big Blue (and for the Big Blue).

APPLE II — Chairman Z80 $345. Add Z80 capability to your Apple II/II Plus computer. Runs CP/M programs with our more powerful TPM. Includes 64K memory add on (unlike the competition this is also useable by the 6502/DOS as well as the Z80). TPM, QSAL assembler, QED Screen Editor, and Business Basic. Mfr'd by AMT Research.
Apple Special $175. Buy the Apple Z80 Developer at the same time as the "Chairman" and pay only $175 instead of $325

APPLE Z80 DEVELOPER

Includes: 6502X ($150), MACRO II ($100), MACRO III ($150), QSAL ($200), QED ($150), LINKER ($80), DEBUG I ($80), DEBUG II ($100), ZDDT ($40) and BUSINESS BASIC ($200)
VALUE: $1250 **NOW $325**
$175 when purchased with AMT "Chairman" Board

DISK FORMATS

When ordering software specify which disk format you would like

CODE	DESCRIPTION
8SD	8" IBM 3740 Single Density (128 bytes/26 sectors/77 tracks)
8DD	8" Double Density (256 bytes/26 sectors/77 tracks)
8XD	8" CDL Extended Density (1024 bytes/8 sector/77 traceks 616K)
5SD	5.25" Single Density (TRS80 Model I, Versafloppy I, Tarbell I)
5EP	5.25" Epson Double Density
5PC	5.25" IBM PC Double Density
5XE	5.25" Xerox 820 Single Density
5OS	5.25" Osborne Single Density
5ZA	5.25" Z80 Apple (Softcard compatible)

TPM INFO When ordering TPM I or II, in addition to Disk Format, please specify one of the following codes

	CODE	DESCRIPTION
TPM I:	NSSD/H	North Star Single Density for Horizon I/O
	NSSD/Z	North Star Single Density for Zapple I/O
	NSDD/H	North Star Double Density for Horizon I/O
	NSDD/Z	North Star Double Density for Zapple I/O
	TRS80-I	TRS-80 Model I (4200H Offset)
	TRS80II	TRS-80 Model II
	VI8	Versafloppy I 8"
	VI5	Versafloppy I 5.25"
TPM-II:	VII8	Versafloppy II 8" (XD)
	VII5	Versafloppy II 5.25"
	TRS80II	TRS-80 Model II (XD)

ORDERING INFORMATION:

VISA/MasterCard/C.O.D.
Call or Write With Ordering Information....

OEMS:

Many CDL products are available for licensing to OEM's. Write to Carl Galletti with your requirements.

Dealer Inquiries Invited.

For Phone Orders ONLY Call Toll Free...

1-(800) 458-3491 (Except Pa.)

Ask For Extension #15

For information and Tech Queries call
(609) 599-2146

Prices and Specifications subject to change without notice.
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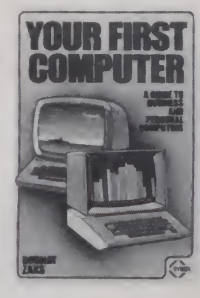
Introductory Special Interests

MICROCOMPUTING ● BOOKS



THE 8086/8088 PRIMER—An Introduction to their Architecture, System Design and Programming, Second Edition by Stephen P. Morse This is written by the man responsible for the design of the 8086 microprocessor and provides novices and professionals alike with a through introduction to Intel's 8086 and 8088 microprocessors. The book discusses architecture—the machine organization of the 8086/8088, covering register and memory structure, addressing modes and the 8086/8088 instruction set. Chapters on programming include a low level programming language, ASM-86, and a high level language, PL/M-86, plus the PASCAL language. BK1274 $11.95

MICROCOMPUTER DATA COMMUNICATIONS SYSTEMS by Frank J. Derfler. This text has a lot of good information on message systems and information utilities; the fundamentals of data communications, modems, terminals, and software for specific microcomputers. Interesting and informative for the beginner, yet a good reference for the experienced data communications user. BK1243 $12.95

MASTERING CP/M—by Alan R. Miller For advanced CP/M users or systems programmers who want maximum use of the CP/M operating system, this book takes up where the *CP/M Handbook* leaves off. It will give you an in-depth understanding of the CP/M modules such as CCP (Console Command Processor), BIOS (Basic Input/Output System), and BDOS (Basic Disk Operating System). It explains the incorporation of additional peripherals to the system, console I/O, the use of the file control block and much more. It also includes a library of useful macros and a comprehensive set of appendices. BK1263 $15.95

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YOUR FIRST COMPUTER—by Rodnay Zaks Whether you are using a computer, thinking about using one or considering purchasing one, this book is indispensable. It explains what a computer system is, what it can do, how it works and how to select various components and peripheral units. It is written in everyday language and contains invaluable information for the novice and the experienced programmer (The first edition of this book was published under the title "An Introduction to Personal and Business Computing") BK1191 $8.95*

MICROPROCESSOR INTERFACING TECHNIQUES—by Austin Lesea & Rodnay Zaks—will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or S-100. BK1037 $17.95.*

THE CP/M HANDBOOK (with MP/M)—by Rodnay Zaks. A complete guide and reference handbook for CP/M—the industry standard in operating systems. Step-by-step instruction for everything from turning on the system and inserting the diskette to correct user discipline and remedial action for problem situations. This also includes a complete discussion of all versions of CP/M up to and including 2.2, MP/M and CDOS. BK1187 $14.95.*

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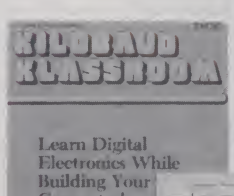
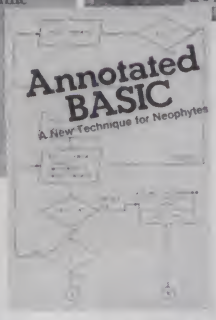
A USER GUIDE TO THE UNIX SYSTEM by Jean Yates and Rebecca Thomas. Here at last is a clearly written book that allows you to use the Unix operating system easily, and at a fraction of the time it previously took. If you're using, evaluating or simply curious about this system, this is your book. BK1242 $15.99

WORDSTAR MADE EASY by Walter A. Ettlin. Now WordStar is as simple to learn as it is easy to use. This book teaches WordStar in 14 easy lessons, saving hours of hard work. it comes with a convenient pull-out Command Card. BK1239 $11.95

INTRODUCTION TO WORD PROCESSING by Hal Glatzer. This book explains in plain language what a word processor can do, how to use one, how it improves productivity—especially in businesses that handle lots of words—and how to buy one wisely. No technical knowledge required, for all first-time users and those considering purchasing a word processor. BK1238 $12.95

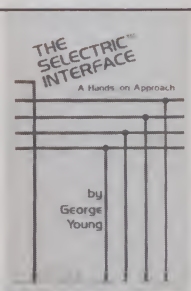
WAYNE GREEN BOOKS





KILOBAUD KLASSROOM—by George Young and Peter Stark. Learning electronics theory without practice isn't easy. And it's no fun to build an electronics project that you can't use. *Kilobaud Klassroom* the popular series first published in *Kilobaud Microcomputing*, combines theory with practice. This is a *practical* course in digital electronics. It starts out with very simple electronics projects, and by the end of the course you'll construct your own working microcomputer!

Authors Young and Stark are experienced teachers, and *their approach is simple* and direct. Whether you're learning at home or in the classroom, this book provides you with a solid background in electronics—and you'll own a computer that you built yourself! BK7386 $14.95



COMPUTER CARNIVAL—by Richard Ramella. Your child can become a crackerjack computerist with the sixty TRS-80 Level II programs in COMPUTER CARNIVAL. This large-type, spiral bound book for beginners is a veritable funhouse of games, graphics, quizzes and puzzles. Written by *80 Micro* columnist Richard Ramella, the programs are challenging enough to ensure continued learning, yet short enough to provide your child with the immediate delight and reward of mastering basic computing skills. And for even greater enjoyment, get the CARNIVAL COMPANION, a 30-minute cassette containing all the programs in the book. Eliminates tiresome typing and lets your child spend more time enjoying the programs. BK7389 $16.97 CC7389 Book and Cassette $24.97

THE NEW WEATHER SATELLITE HANDBOOK—by Dr. Ralph E. Taggart WB8DQT. Here is the completely updated and revised edition containing all the information on the most sophisticated and effective spacecraft now in orbit. This book serves both the experienced amateur satellite enthusiast and the newcomer. It is an Introduction to satellite watching, providing all the information required to construct a complete and highly effective ground station. Solid hardware designs and all the instructions necessary to operate the equipment are included. For experimenters who are operating stations, the book details all procedures necessary to modify equipment for the new series of spacecraft. Amateur weather satellite activity represents a unique blend of interests encompassing electronics, meteorology and astronautics. Join the privileged few in watching the spectacle of earth as seen from space on your own monitoring equipment. BK7383 $8.95.*

TEXTEDIT—A Complete Word Processing System in Kit Form—by Irwin Rappaport. TEXTEDIT is an inexpensive word processor that you can adapt to suit your differing needs—from form letters to lengthy texts. Written in TRS-80 Disk BASIC, the system consists of several modules, permitting the loading and use of only those portions needed. A disk is also available which provides the direct loading of the modules, however, the book is required for documentation. For Model I and III with TRSDOS CONVERT., one disk drive (2 disk drives or copy utility needed to transfer to system disk). Runs under TRSDOS 2.2/2.3. May not function under other systems. BK7387 $9.97 Disk DS7387 $19.97

THE SELECTRIC INTERFACE—by George Young. You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer. SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included. BK7388 (125 pages) $12.97

ANNOTATED BASIC A New Technique for Neophytes—Put your BASIC knowledge to work for you with this 2-volume set of TRS-80 Level II BASIC programs. Gain a better understanding of the elements and techniques involved in programming. *Annotated BASIC's* uniquely designed format breaks each program down for you to include: initial documentation and instruction, definitions of New BASIC Concepts, flowchart, annotations of sections, showing how each part fits into the whole, and explaining *why certain* BASIC commands are chosen over similar ones. Using the programs as they are or modifying them to sharpen your programming skills, *Annotated BASIC* is a helpful tool for any BASIC programmer.
BK7384 (Vol. 1, 152 pages) $10.95
BK7385 (Vol. 2, 136 pages) $10.95

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Programming/Languages

6502/Apple/Vic

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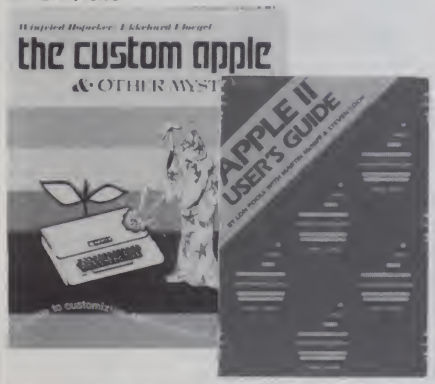

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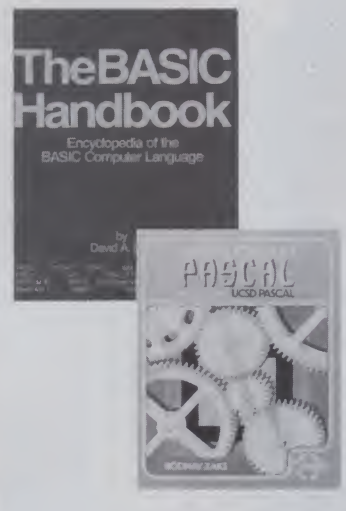

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7403	18	7438	.24	7486	.35	74141	.49	74180	.85	LM301H	.45
7404	18	7440	18	7489	3.25	74145	.45	74182	.75	LM307H	.45
7405	21	7443	48	7490	.30	74148	1.20	74186	8.50	LM308AN	2.25
7406	25	7444	89	7491	.35	74152	.55	74190	.75	LM309K	1.25
7408	22	7445	.55	7492	.35	74153	.55	74191	.75	LM310	1.45
7409	17	7447	.45	7493	.30	74154	1.25	74192	.85	LM311	.50
7410	17	7448	.55	7494	.85	74155	.55	74194	.85	LM317K	3.85
7412	21	7450	18	7495	.45	74160	.85	74195	.75	LM318H	1.45
7413	21	7451	18	74107	.30	74161	.85	74197	.80	LM322	1.55
7414	32	7454	18	74109	.38	74164	.89	74221	1.10	LM323K	4.95
7416	25	7472	.23	74110	.45	74165	.89	74279	.85	LM324	.55
7420	18	7474	.28	74121	.28	74166	.90	74293	.85	LM339	.99
7425	24	7475	.36	74122	.35	74173	.85	74298	.85	LM348	1.25
7426	29	7476	.30	74123	.39	74174	.89	74367	.55	LM358	.85
7427	25	7480	.48	74125	.35	74175	.75	74393	1.35	LM380	1.10
7429	40									LM381	1.85
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74LS00	.21	74LS55	.25	74LS139	.50	74LS194	.85	74LS299	1.95	LM531	1.95
74LS02	.24	74Ls73	.38	74LS145	1.15	74LS195	.85	74Ls323	4.55	LM555	.27
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74LS04	.23	74LS75	.38	74LS148	1.35	74LS197	.75	74LS353	1.05	LM558	2.45
74LS05	.20	74LS76	.38	74LS151	.55	74LS221	.95	74LS365	.45	LM565	.95
74LS08	.24	74LS78	.42	74LS153	.50	74LS240	.95	74LS368	.45	LM566	1.45
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74LS10	.23	74LS85	.60	74LS155	.75	74LS242	.95	74LS368	.45	LM709	.40
74LS11	.30	74LS86	.30	74LS158	.75	74LS243	1.25	74LS373	.90	LM710	.75
74LS12	.29	74LS90	.50	74LS157	.55	74LS244	.85	74LS374	.95	LM711	.49
74LS13	.40	74LS91	.85	74LS158	.85	74LS245	1.85	74LS375	.75	LM720	1.75
74LS14	.45	74LS92	.50	74LS160	.89	74LS247	1.10	74LS377	.95	LM723	.55
74LS15	.29	74LS93	.50	74LS161	.85	74LS248	1.10	74LS378	.95	LM733	.95
74LS20	.24	74LS95	.85	74LS162	.89	74LS249	1.10	74LS379	1.10	LM741-8	.35
74Ls21	.20	74LS96	.89	74LS163	.85	74LS251	.55	74LS388	.45	LM741N-14	.35
74LS22	.24	74LS107	.38	74LS164	.85	74LS253	.55	74LS390	1.15	LM741H	.35
74LS26	.28	74LS109	.38	74LS165	.85	74LS257	.50	74LS393	1.15	LM747	.85
74LS27	.28	74LS112	.38	74LS168	1.75	74LS258	.55	74LS395	1.15	LM775	.25
74LS28	.28	74LS1 3	.38	74LS188	1.55	74LS259	1.25	74LS399	1.25	1330	1.60
74LS30	.24	74LS114	.38	74LS189	1.55	74LS280	.55	74LS490	1.75	1349	1.75
74LS32	.27	74LS122	.45	74L3170	1.35	74LS268	.55	74LS623	1.75	1350	1.15
74Ls33	.35	74LS123	.85	74LS173	.85	74LS273	1.45	74LS668	1.25	1358	1.35
74LS37	.30	74LS125	.45	74LS174	.55	74Ls279	.45	74LS689	1.25	1372	4.95
74LS38	.32	74LS126	.48	74LS175	.85	74LS280	1.85	74LS670	1.45	1456	.55
74LS42	.45	74LS132	.58	74LS181	1.95	74LS283	.85	74LS683	2.75	1488	.85
74LS46	.75	74LS133	.55	74LS190	.89	74Ls290	.95	74LS685	2.75	1489	.85
74LS49	.75	74LS136	.38	74LS191	.89	74LS293	.85	74LS687	3.50	1498	.85
74LS51	.24	74LS137	.85	74LS192	.75	74LS295	.95	74LS783	18.95	1889	1.55
74LS54	.25	74LS138	.50	74LS193	.75	74LS298	.85			4501	1.50
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74S

74S00	.30	74S32	.40	74S138	.85	74S194	1.25	74S280	1.75		
74S02	.30	74S37	.85	74S140	.40	74S195	1.25	74S287	2.95		
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74S04	.30	74S50	.25	74S157	.95	74S240	1.95	74S289	5.95		
74S05	.30	74S51	.25	74S158	.95	74S241	1.95	74S299	5.95		
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74S09	.35	74S65	.35	74S163	3.75	74S251	.85	74S374	2.45		
74S10	.35	74S74	.50	74S174	.95	74S253	.85	74S387	1.90		
74S11	.35	74S65	1.25	74S175	.95	74S257	.85	74S454	4.50		
74S15	.35	74S86	.35	74S182	1.75	74S258	.85	74S471	4.75		
74S20	.35	74S112	.45	74S168	1.55	74S280	.55	74S472	4.75		
74S22	.35	74S124	2.50	74S189	4.95	74S275	12.95	74S474	4.75		
74S30	.30	74S132	1.10								

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RAMS

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2101	1.95	2111	2.95	4118-200NS	8/11.95	4184-200NS	8.25				

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6502	5.95	6800	8.25	6810	2.95	6845	12.50	6852	5.25
6522	8.75	6802	7.75	6821	3.00	6847	11.95	6880	9.50
6532	10.25	6809	12.50	6840	10.50	6850	3.25		

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1702	3.95	2716	3.25	2532	8.25	2732	4.95	2764	12.50
2708	3.95								

Z80

Z80CPU	3.95	Z80PIO	5.95	Z80SIO	15.50	Z80ACPU	8.00	Z80APIO	8.25
Z80CTC	5.95	Z80SIO/2	12.50			Z80ACTC	8.50		

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LM555	.27	LM1349	1.75
LM556	1.10	LM1350	1.15
LM558	2.45	LM1358	1.35
LM565	.95	LM1372	4.95
LM566	1.45	LM1456	.55
LM703	.75	LM1488	.85
LM709	.40	LM1489	.85
LM710	.75	LM1498	.85
LM711	.49	LM1889	1.55
LM720	1.75	LM4501	1.50
LM723	.55	LM4558	.75
LM733	.95		
LM741-8	.35		
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S-100 Memory Boards

64K Static RAM - JADE

Uses new 2k x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less than 500ma

MEM-99152B *Bare board* — **$49.95**
MEM-99152K *Kit less RAM* — **$99.95**
MEM-32152K *32K kit* — **$199.95**
MEM-56152K *56K kit* — **$289.95**
MEM-64152K *64K kit* — **$299.95**
Assembled & Tested — **add $50.00**

EXPANDORAM iII

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, compatible with CP/M, MP/M, Oasis, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software

MEM-65064A *64K A & T* — **$474.95**
MEM-65128A *128K A & T* — **$274.95**
MEM-65192A *192K A & T* — **$674.95**
MEM-65256A *256K A & T* — **$774.95**
SFC-55009000F *RAMDISK sftwr CP/M 2.2* — **$44.95**
SFC-5500900F *RAMDISK with EXRAM III* — **$24.95**

Letter Quality Printers

Lowest Price Daisywheel Printer - JUKI

Full featured daisywheel printer with graphics mode and built-in word processing functions. 18 CPS print speed, 13-inch platen, 10, 12, or 15 pitch plus proportional spacing. Uses standard IBM ribbons. This is an extremely reliable letter quality printer, at an unheard of low price!

PRD-61001 *Parallel* — **$629.95**
PRD-61002 *RS232 serial board* — **$59.95**
PRA-61000 *Tractor option* — **$139.95**

380Z by Data Terminals & Communications

Based on the same quality mechanism as the Comrex printer, the 380Z contains electronic enhancements that allow it to print at speeds up to 32 CPS. Other features include a 48K buffer, proportional spacing and Diablo 1640/1650/630 compatible protocol. Comes with printwheel, ribbon and users manual. Serial, parallel, and IEEE 488 interfaces standard

PRD-11300 *380Z printer* — **$1295.00**
PRA-11000 *Tractor option* — **$169.95**
PRA-12000 *Cut Sheet Feeder* — **$699.95**

Printers From JADE

SEIKOSHA *10" Graphics, 30 CPS* — **$229.95**
OKIDATA 82 *10" 120 CPS* — **CALL**
OKIDATA 92 *10" 160 CPS* — **CALL**
OKIDATA 93 *15" 160 CPS* — **CALL**
OKIDATA 83 *15" 120 CPS* — **CALL**
OKIDATA 84 *15" 200 CPS* — **CALL**
OKIDATA 2350 *15" 350 CPS* — **CALL**
OKIDATA 2410 *15" 350 CPS* — **CALL**
DAISYWRITER 2000 *48K Daisywheel* — **$1395.00**
GEMINI 10 *100 CPS with Graphics* — **$349.95**
GEMINI 15 *15" with Graphics* — **$499.95**
COMREX CR1 — **$849.95**

S-100 I/O Boards

The Bus Probe - JADE

Inexpensive S-100 Diagnostic Analyzer

TSX-200B *Bare board* — **$59.95**
TSX-200K *Kit* — **$129.95**
TSX-200A *A & T* — **$159.95**

I/O-4 - SSM Microcomputer

2 serial I/O ports plus 2 parallel I/O ports

IOI-1010A *A & T* — **$249.95**

I/O-5 - SSM Microcomputer

Two serial & 3 parallel ports, 110-19.2K Baud

IOI-1015A *A & T* — **$289.95**

Interfacer 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel

IOI-1840A *A & T* — **$314.95**
IOI-1840C *CSC* — **$414.95**

S-100 EPROM Boards

PB-1 - SSM Microcomputer

2708, 2716 EPROM board with on-board programmer

MEM-99510A *A & T with manual* — **$219.95**

PROM-100 - SD Systems

2708, 2716, 2732 EPROM programmer with software

MEM-99520K *Kit with software* — **$189.95**
MEM-99520A *A & T with software* — **$249.95**

32K PROM/RAM Board

The 32K S-100 PROM/RAM board can hold up to 16 each 2716 style EPROMs, 6116 style RAMs, or 8 each style EPROMs. This board was designed to fit into holder S-100 systems as well as the newer IEEE-696 machines. Uses 5 volt only EPROM/RAMs, allows operation as a 2K to 32K board, meets IEEE-696 S-100 proposed standard, addressable as two 16K blocks on any 64K page, supports Cromemco as well as Northstar bank select, perfect for MP/M systems

MEM-99153B *Bare board & manual* — **$49.95**
MEM-99153K *Kit with No RAM* — **$89.95**
MEM-99153A *A & T with No RAM* — **$139.95**
MEM-16153K *Kit with 16K RAM* — **$129.95**
MEM-16153A *A & T with 16K RAM* — **$179.95**
MEM-32153K *Kit with 32K RAM* — **$179.95**
MEM-32153A *A & T with 32K RAM* — **$229.95**
Call Us For Lowest Prices On EPROMs - 2732s — **$4.90**

Video Monitors

Video Monitors - USI

Ultra-high (1000 lines) resolution, 20 MHz bandwidth. Available in 9 inch or 12 inch, amber or green screen. USI is the "Cadillac" of monochrome video monitors!

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VDM-741220 *12" green* — **$159.95**
VDM-741210 *12" amber* — **$179.95**

S-100 CPU Boards

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included

CPC-30200A *A & T* — **$329.95**

The Big Z - JADE

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accommodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600

CPU-30201B *Bare board w/manual* — **$35.00**
CPU-30201K *Kit with Manual* — **$149.95**
CPU-30201A *A & T with Manual* — **$199.95**

2810 Z-80 CPU - C.C.S.

2 or 4 MHz Z-80 CPU with serial I/O port & on board monitor PROM, front panel compatible

CPU-30400A *A & T with PROM* — **$289.95**

CPU-Z CompuPro

2 or 4 MHz Z-80A CPU, 24 bit addressing

CPU-30500A *2/4 MHz A & T* — **$279.95**
CPU-30500C *3/6 MHz CSC* — **$374.95**

8085/8088 - CompuPro

Both8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megabytes of memory

CPU-20510A *MHz A & T* — **$398.95**
CPU-20510C *6/8 MHz CSC* — **$479.95**

Dual Disk Sub-Systems

Disk Sub-Systems - JADE

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never mar rubber feet, all necessary hardware to mount 2-8 inch disk drives, power supply, and fan, does not include signal cable

Dual 8-Inch Sub-Assembly Cabinet

END-000420 *Bare cabinet* — **$49.95**
END-000421 *Cabinet kit* — **$199.95**
END-000431 *A & T* — **$249.95**

8-inch Sub-Systems - Single Sided, Double Density

END-000423 *Kit w/2 Siemens FD100-8Ds* — **$650.00**
END-000424 *A & T w/2 Siemens FD100-8Ds* — **$695.00**
END-000433 *Kit w/2 Shugart SA-801Rs* — **$999.95**
END-000434 *A & T w/2 Shugart SA-801Rs* — **$1195.00**

8-inch Sub-Systems - Double-Sided Double Density

END-000426 *Kit w/2 Qume DT-8s* — **$1274.95**
END-000427 *A & T w/2 Qume D-8s* — **$1474.95**
END-000436 *Kit w/2 Shugart SA-851Rs* — **$1274.95**
END-000437 *A & T w/2 Shugart SA-851Rs* — **$1474.95**

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Ultra-Violet EPROM ERASERS

Inexpensive erasers for industry or home

XME-3100A *Spectronics w/o timer* — **$69.50**
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Shugart SA 400L *Sigle sided, double density 40 track*
MSM-104000 ______ $234.95 ea 2 for **$224.95 ea**

Tandon TM 100-2 *Double sided, double density 48 TPI*
MSM-551002 ______ $294.95 ea 2 for **$269.95 ea**

TEAC FD55A *Single sided, double density 40 track*
MSM-660551 ______ $299.95 ea 2 for **$239.95 ea**

5¼ Inch Cabinets with Power Supply

END-000216 *Single cab w/power supply* ______ **$69.95**
END-000226 *Dual cab w/power supply* ______ **$94.95**

S-100 Motherboards

ISO-BUS - JADE

Silent, simple and on sale - a Better Motherboard

6 Slot (5¼ inch x 8⅝ inch)

MBS-061B *Bare board* ______ **$22.95**
MBS-061K *Kit* ______ **$39.95**
MBS-061A *A & T* ______ **$69.95**

12 Slot (9¾ inch x 8⅝ inch)

MBS-121B *Bare board* ______ **$34.95**
MBS-121K *Kit* ______ **$69.95**
MBS-121A *A & T* ______ **$109.95**

18 Slot (14½ inch x 8⅝ inch)

MBS-181B *Bare board* ______ **$54.95**
MBS-181K *Kit* ______ **$99.95**
MBS-181A *A & T* ______ **$149.95**

8 inch Disk Drives

Siemens FDD 100-8 *Single sided, double density*
MSF-201120 ______ $274.95 ea 2 for **$249.95 ea**

Shugart SA 801R *Single sided, double density*
MSF-10801R ______ $394.95 ea 2 for **$389.95 ea**

Shugart SA851R *Double sided, double density*
MSF-10851R ______ $554.95 2 for **$529.95 ea**

Qume DT-8 *Double sided, double density*
MSF-750080 ______ $554.95 2 for **$529.95 ea**

Tandon TM848-1 *Single sided, double density thin line*
MSF-558481 ______ $379.95 ea 2 for **$369.95 ea**

Tandon TM848-2 *Double sided, double density thin line*
MSF-558482 ______ $494.95 ea 2 for **$484.95 ea**

NEC FD1165 *Double sided, double density half high*
MSF-558482 ______ $485.00 ea 2 for **$449.95 ea**

NEW! CP/M plus 3.0

CP/M 3.0 is Digital Research's latest version of the industry standard disk operating system. It features many performance improvements, such as intelligent record buffering, improved diretory handling, "HELP" facility, time date stamping of files and many more improvements. AND A TREMENDOUS INCREASE IN SPEED!! it is fully CP/M 2.2 compatible and requires no changes to your existing application software. Available only to Versafloppy II owners with SBC-200 CPUs

SFC-55009059F *Unbanked,* ______ **$250.00**
SFC-55009057F *Banked,* ______ **$250.00**
SFC-55009057D *Manual* ______ **$50.00**

CP/M Plus On EPROM

SFC-55009059E *Unbanked RS232* ______ **$400.00**
SFC-55009057E *Banked RS232* ______ **$400.00**

Modems

Smart Buy In MODEMS - Signalman

1200 and/or 300 baud, direct connect, automatic answer or originate selection, auto-answer/auto-dial on deluxe models. 9v battery allows total portability, full one year warranty

IOM-5600A *300 baud direct connect* ______ **$89.95**
IOM-5610A *300 baud Deluxe* ______ **$149.95**
IOM-5620A *1200/300 baud Deluxe* ______ **$369.95**
IOM-5650A *300 baud for Osborne* ______ **$119.95**
IOM-5630A *300 baud card for IBM* ______ **$269.95**

Smartmodem - HAYES

Sophisticated direct-connect auto answer/auto dial modem, touch tone or pulse dialing. RS-232C interface, programmable

IOM-5500A *Smartmodem 1200* ______ **$599.95**
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IOK-1500A *Hayes Chronograph* ______ **$218.95**
IOM-1100A *Micromodem 100* ______ **$368.95**
IOM-2010A *Micromodem II w/term prgm* ______ **$329.95**
IOM-2012A *Terminal program for MMII* ______ **$89.95**

1200 Baud Smart Cat - NOVATION

103/212 Smart Cat & 103 Smart Cat, 1200 & 300 baud, built-in dialer, auto redial if busy, auto answer/disconnect, direct connect, LED readout displays mode, analog/digital loopback self tests, usable with multi line phones

IOM-5241A *300 baud 103 Smart Cat* ______ **$229.95**
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1/5 the size of ordinary modems, Bell 103, manual or auto-answer, automatic answer/originate, direct connect, built in self test, two LEDs and audio beeps provide status information

IOM-5261A *Novation* ______ **$149.95**

S-100 Disk Controllers

DISK 1 - CompuPro

8 inch or 5¼ inch DMA disk controller, single or double density, single or double sided, 10MHz

IOD-1810A *A & T* ______ **$449.95**
IOD-1810C *CSC* ______ **$554.95**

Versafloppy II - SD Systems

Double density disk controller for any combination of 5¼ inch and 8 inch single or double sided, analog phase locked loop data seperator, vectored interrupts. CP/M 2.2 Oasis compatible, control/diagnostic software PROM included

IOD-1160A *A & T with PROM* ______ **$359.95**
SFC-55009047F *CP/M 3.0 with VF-11* ______ **$139.95**

2422 Disk Controller - C.C.S.

5¼ inch or 8 inch double density disk controller with on board boot loader ROM, FREE CP/M 2.2 & manual set

IOD-1300A *A & T with CP/M 2.2* ______ **$399.95**

Double D - JADE

High reliability double density disk controller with on board Z-80A, auxiliary printer port. IEEE S-100 can function in multi-user interrupt driven bus

IOD-1200B *Bare board & hdwr man* ______ **$59.95**
IOD-1200K *Kit w/hdwr & sftwr man* ______ **$299.95**
IOD-1200A *A & T w/hdwr & sftwr man* ______ **$325.95**
SFC-59002001F *CP/M 2.2 with Double D* ______ **$99.95**

Single Board Computer

Superquad - ADV. MICRO DIGITAL

Single board standard size S-100 computer system, 4 MHz Z-80A single or double density disk controller for 5¼ inch or 8 inch drives, 64K RAM extended sddressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible

CPC-3800A *A & T* ______ **$724.95**
IOX-4232A *Serial I/O adapter* ______ **$29.95**

8" Slimline Sub-Systems

Dual Slimline Sub-Systems - JADE

Handsome vertical cabinet with scratch resistant baked enamel finish, proportionally balanced air flow system, quiet cooling fan, rugged dual drive power cables, power switch, line cord, fuse holder, cooling fan, all necessary hardware to mount 2-8 inch slimline disk drives, does not include signal cable

Dual 8-Inch Slimline Cabinet

END-000820 *Bare cabinet* ______ **$59.95**
END-000822 *A & T w/o drives* ______ **$179.95**

Dual 8-Inch Slimline Sub-Systems

END-000823 *Kit w/2 SS DD* ______ **$919.95**
END-000824 *A & T w/2 SS DD* ______ **$949.95**
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DISK DRIVE - Apple™ Compatible

Totally Apple™ compatible, 143,360 bytes per drive on DOS 3.3, full one year factory warranty, half track capability reads all Apple software, plugs right into Apple controller as second drive, DOS 3.3, 3.2.1 Pascal & CP/M compatible

MSM-431010 *Drive for Apple* ______ **$239.95**
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MSM-431040 *Controller w/software* ______ **$99.95**

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Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M 2.2 and complete manual set, Pascal compatible, utilities are menu-driven, one year warranty

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80 column x 24 line video card for Apple II, addressable 25th status line, normal/inverse or high/low video, 128 ASCII characters, upper and lower case, 7 x 9 dot matrix with true descenders. CP/M, Pascal & Fortran compatible. 50/60 Hz. 40/80 column selection from keyboard. Best 80 column card!

IOV-2450A *Viewmax 80* ______ **$149.95**
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Serial I/O Card - A.L.S.

Full feature serial card for modems & printers, baud rates from 110 to 19,200, CTC/RTS & X-on/X-off protocols, auto line feed, RS-232C cable interface included

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The most powerful card available for your Apple!

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68K - 68000 16 BIT CPU

16 bit 8 or 10 MHz on-board sockets for 2716 2732 or 2764 EPROMs for up to 8K x 16 of memory

Part No.	Description	List Price	Our Price
KTGBT184A	A&T 8MHz	$695.00	$518.95
KTGBT184C	CSC 10MHz	$850.00	$765.00

CP/M® NOW AVAILABLE!!

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FORTH OPERATING SYSTEM FOR 68K CPU

Requires a DISK 1 64K of CompuPro memory and an INTERFACER 3 or 4

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KTGBT186A87	A&T with 8087 option	$1050.00	$939.00
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*8087 Limits clock speed to 5MHz

DUAL PROCESSOR 8085-8088

6 or 8 MHz provides true 16 Bit Power with a standard 8 bit S-100 bus.

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3/6 MHz Z80B CPU with 24 Bit Addressing.

FASTEST Z80 CPU AVAILABLE!

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Fast DMA. Soft Sector. Controls Up to Four 8" or 5¼" Single or Double Density Drives!

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KTGBT171A	Disk 1 Controller A&T	$495.00	$368.95
KTGBT171C	Disk 1 Controller CSC	$595.00	$550.00
KTGBTCPM80	CP/M 2.2® for Z80/8085 w/manual & BIOS 8" S/D disk		$148.95
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DISK 2/SELECTOR CHANNEL HARD DISK CONTROLLER

Fast DMA 2 board set controls 4 Shugart 4000 series or Fujitsu 2300 type drives. Includes CP/M 2.2®.

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M-DRIVE/H HARDWARE LOGICAL DISK SYSTEM

Interfaces through two I/O ports, and runs at 10MHz IEEE 696 compatible. Requires any CompuPro CPU and a DISK 1. Each board contains 512K of fast, low power (900mA) RAM, with parity checking.

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STATIC RAM

RAM 17 - 64K CMOS STATIC RAM

12 MHz, RAM 17, 2 Watt, DMA Compatible 24 Bit Addressing

KTGBT175A64	64K A&T 12MHz	$499.00	$460.00
KTGBT175C64	64K CSC 12MHz	$599.00	$550.00

RAM 16 - 32K x 16 BIT CMOS STATIC RAM

8 and/or 16 Bit 12MHz, RAM 16, 32K x 16 or 64K x 8 IEEE/696 16 Bit 2 Watt, 24 Bit Addressing

KTGBT180A	64K A&T 12MHz	$550.00	$510.00
KTGBT180C	64K CSC 12MHz	$650.00	$610.00

RAM 21 - 128K STATIC RAM

816 RAM 21 12MHz, 128K x 8 or 64K x 16 IEEE/696 8 or 16 Bit, 1.2 Amps, 24 Bit Addressing

KTGBT190A	128K A&T	$1095.00	$995.00
KTGBT190C	128K CSC	$1245.00	$1125.00

CompuPro®

I/O BOARDS

SYSTEM SUPPORT 1 MULTIFUNCTION BOARD

Serial port (software prog. baud), 4K RAM included, 15 levels of interrupt, real time clock, optional math processor.

Part No.	Description	List Price	Our Price
KTGBT182A	Assembled & Tested	$450.00	$308.95
KTGBT182C	CSC	$550.00	$495.00
KTGBT8231	Math Chip		$195.00
KTGBT8232	Math Chip		$195.00
KTGBT162AM1	A&T w/8231 Math Chip	$645.00	$538.95
KTGBT162CM1	CSC w/8231 Math Chip	$745.00	$670.00
KTGBT162AM2	A&T w/8232 Math Chip	$645.00	$538.95
KTGBT162CM2	CSC w/8232 Math Chip	$745.00	$670.89

MPX CHANNEL BOARDS

I/O Multiplexer, using 8085A-2 CPU on board w/16K RAM

KTGBT188A16	Assembled & Tested	$649.00	$584.89
KTGBT188C16	CSC	$749.00	$674.89

INTERFACER 1

Two Serial I/O

KTGBT133A	Assembled & Tested	$295.00	$198.95
KTGBT133C	CSC	$370.00	$329.00

INTERFACER 2

Three parallel, one serial I/O board

KTGBT150A	Assembled & Tested	$325.00	$249.00
KTGBT150C	CSC	$399.00	$359.00

INTERFACER 3

Eight-channel multi-user serial I/O board

KTGBT1748A	Assembled & Tested	$699.00	$448.95
KTGBT1748C	CSC 200 hr. 8 port	$849.00	$748.89
KTGBT1745A	Assembled & Tested	$599.00	$518.95
KTGBT1745C	CSC 200 hr. 5 port	$699.00	$828.89

INTERFACER 4

Three Serial, 1 Parallel, 1 Centronics Parallel

KTGBT187A	Assembled & Tested	$450.00	$314.87
KTGBT187C	CSC	$540.00	$414.87

S-100 MOTHERBOARDS

Active Termination, 6-12-20 Slot

KTGBT153A	A&T 6 slot (2 lbs.)	$140.00	$125.00
KTGBT153C	CSC 6 slot (2 lbs.)	$190.00	$155.00
KTGBT154A	A&T 12 slot (3 lbs.)	$175.00	$155.00
KTGBT154C	CSC 12 slot (3 lbs.)	$240.00	$220.00
KTGBT155A	A&T 20 slot (4 lbs.)	$265.00	$235.00
KTGBT155C	CSC 20 slot (4 lbs.)	$340.00	$310.00

California Computer Systems

Z80 CPU 2 or 4MHz

On board RS232 Serial port, On board 2K Monitor, ROM, Power on jump to any location in 64K, LED status indicators for ROM select, halfstate and interrupts.

KTCCS2810A	Z80A 4MHz CPU A&T	$325.00	$258.95

CCS271901

KTCCS271901	2 Serial, 2 Parallel, A&T	$360.00	$288.95

CCS272001

KTCCS272001	4 Port Parallel, A&T	$275.00	$218.95

CCS271001

KTCCS271001	4 Port Serial, A&T	$325.00	$278.95

CCS283001

KTCCS283001	Assembled & Tested	$550.00	$428.95

CCS206601

64K Dynamic S-100 RAM. Cromemco CROMIX™ Compatible.

KTCCS206601	Assembled & Tested	$450.00	$425.00

CCS2422A

Floppy disk controller w/CP/M 2.2®

KTCCS2422A	Assembled & Tested	$475.00	$338.95

SSM

IO5

2 Serial, 3 Parallel S-100 Interface

Part No.	Description	List Price	Our Price
KTSSMIO5A	Assembled & Tested	$329.00	$289.95

IO8

8 Port Serial I/O S-100 Board

KTSSMIO8A	Assembled & Tested	$550.00	$450.00

IO4

2 Serial, 2 Parallel I/O S-100 Board

KTSSMIO4A	Assembled & Tested	$290.00	$245.00

2708/2716 EPROM PROGRAMMER & EPROM BOARD

Programs 2708 and 2716 EPROMs. Holds 4 2708s (4K) or 4 2716s (8K)

KTSSMB8A	Assembled & Tested	$265.00	$219.87

DUAL

NON VOLATILE CMOS RAMS

8, 16, or 32K 8 or 16 Bit Data. Battery Backup On Board 6MHz, Bank Selectable

KTOULCMEM8	8K A&T	$495.00	$450.00
KTOULCMEM16	16K A&T	$595.00	$550.00
KTOULCMEM32	32K A&T	$695.00	$850.00

256K DYNAMIC MEMORY

256K, 230 ns access time, 2 x 128K organization, 24 bit addressing, parity error detection.

KTOULOMEM256K	Assembled & Tested	$1295.00	$1195.00

32/64K EPROM BOARD

8 or 16 bit data, holds 2716s (32K), or 2732s (64K)

KTOULEPROM32	For 2716s A&T	$295.00	$275.00
KTOULEPROM64	For 2732s A&T	$295.00	$275.00

A/D CONVERTER

12 Bit Resolution 16 or 32 Channel Input

KTOULAIM12	Assembled & Tested	$695.00	$625.00
KTOULAIM12B	Without instru. Amp	$645.00	$598.00

D/A CONVERTER

4 Channel, 12 Bit, 3 Output Modes

KTOULAOM12	Assembled & Tested	$695.00	$818.95

SIERRA DATA SCIENCES

S-100 SBC BOARD

Z80A 4MHz, 2 Serial RS232 interfaces, 1 parallel interface, 64K RAM, Floppy Disk Controller, provisions for one 2732 EPROM — ALL ON THIS ONE BOARD!!

KTSOSSBC	Z80A SBC A&T	$895.00	$655.00
KTSOSCPM	CP/M® Operating System on 8" disk		$150.00
KTSOSTURBOS	Single User TurboDos™ on 8" disk		$450.00
KTSOSTURBOM	Multi-User TurboDos™ on 8" disk		$750.00

S-100 Z80A SLAVE SBC

Z80A 4MHz, 2 RS232 Serial ports, 4 parallel ports, 64K RAM, EPROM Programmer. Used in multi-user computer system with SDSSBC.

KTSOSSBCSE	Slave Z80 SBC A&T	$825.00	$565.00

California Computer Systems

64K - 4MHz IEEE/S-100 DYNAMIC RAM

- Operates with either an 8080 or Z-80, providing processor transparent refreshes
- Bank-select system
- Any 16K block can be made bank-independent
- Phantom input
- Assembled & Tested

REGULAR LIST PRICE IS $375.00

$175.00 each
4/$640.00

KTCCS20653 (Shipping Weight 2 lbs.)

RAM BOARD DISK DRIVE BONUS!

As an added bonus, PRIORITY ONE ELECTRONICS is giving away software developed by Micro Resources that will allow 4 CCS20653 boards to be used as an in-memory disk drive! This allows for an incredible speed increase in your computer! This software is available only with the purchase of 4 CCS20653 memory boards. Use Part Number **KTMRSR0SK**. (Shipping Weight: 1 lb.)

RETAIL STORE PHONE NUMBERS: (Chatsworth:) (213) 709-5464 - (IRVINE:) (714) 660-1411

Circle 277 on Reader Service card.

PRIORITY ONE IS NUMBER 1!

OTHERS COME AND GO, WHILE WE HAVE BECOME THE LARGEST MAIL-ORDER DISTRIBUTOR IN THE MICRO-COMPUTER INDUSTRY. ORDER WITH CONFIDENCE. WHEN YOU HAVE A QUESTION, WE'LL BE HERE NEXT WEEK, NEXT MONTH AND NEXT YEAR! WE'RE NUMBER 1 AND STILL TRYING HARDER!

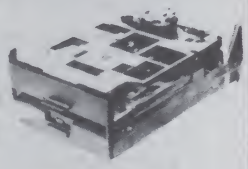
SIEMENS FDD100-8

8" FLOPPY DISK DRIVE

SINGLE SIDED, DOUBLE DENSITY
SHUGART 801R COMPATIBLE

90 DAY WARRANTY!

ONCE AGAIN, YOU RECEIVE THE BENEFIT OF OUR UNEQUALLED PURCHASING POWER!



$199.00 each

$185.00 2 to 9

CALL for 10+

OEM INQUIRIES INVITED
(Include $7.00 per drive for shipping)
KTSIEFOD1D08

ORDER NOW AND SAVE!

BUY DRIVE & CABINET TOGETHER AND $SAVE!!

DUAL 8" SIEMENS FDD1008
DUAL 8" CABINET POWER SUPPLY AND INTERNAL POWER CABLES

- Positive Pressure Filter Cooling
- Power Supply: 4A@+5V, 3A@+24V 1A @ -5V
- Each output is individually fused
- Hinged to for easy access
- Heavy non-flex .090 aluminum base
- Modular power connectors

IF BOUGHT SEPARATELY: $890.00
OUR ANNIVERSARY PRICE:

$675.00
KTPOBIIISIE (Include $30.00 for shipping)

KTIIIFOE002 CABINET ONLY (Sh. Wt. 38 lbs.) ***$295.00***
(Include $30.00 for shipping)

MODEMS

U.S. ROBOTICS

Part No.	Description	List Price	SALE PRICE
KTUSRAOIAL212A	1200 baud Auto Orig/Answer	$599.00	$495.00
KTUSRPASSWORD	1200 baud Auto Orig/Answer	$449.00	$425.00
KTUSRTELPAC8	Password Comm. Software 8" CP/M		$ 79.00
KTUSRTELPAC5A	Password Comm. Software 5¼" Apple		$ 79.00
KTUSRMLNK300	Micro Link 300 Baud	$179.00	$159.00
KTUSRMLNK1200	Micro Link 1200 Baud	$449.00	$369.00
KTUSRALNK300	Auto Link 300 Baud	$219.00	$175.00
KTUSRALNK1200	Auto Link 1200 Baud	$499.00	$399.00

(Shipping Weights on above items: 4 lbs. each)

SEE PAGE 194 OF JULY'S BYTE FOR MORE INFORMATION

D.C. HAYES

KTDCH0400P	1200 Baud Smartmodem (3 lbs.)	$695.00	$514.95
KTDCH0200P	300 Baud Smartmodem (3 lbs.)	$279.00	$229.00
KTOCH0300P	Chronograph (2 lbs.)	$249.00	$199.00
KTOCH0100P	MicroModem 100 (2 lbs.)	$399.00	$349.00
KTOCH0000P	MicroModem II (2 lbs.)	$379.00	$299.00

RIXON

1200 BAUD
AUTO DIAL
DIRECT CONNECT MODEMS WITH 10 NUMBER MEMORY

KTRIXR212A	1200 Baud Stand Alone unit (2 lbs.)	$495.00	$475.00
KTRIXPC212A	1200 IBM PC™ modem (2 lbs.)	$495.00	$475.00
KTRIXPCCOM1	IBM PC™ Modem Software (1 lb.)		$ 89.00
KTPOBRIXIBM	IBM Modem & Software Together (3 lbs.)		$539.00

SEE PAGE 445 OF JULY'S BYTE FOR MORE INFORMATION

MURA DIRECT CONNECT MODEM

$79.00

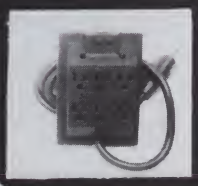
0 - 300 BAUD
MURA MM-100

- 0 - 300 Baud
- RS232C interface
- Full duplex
- Carrier detect indicator
- Bell 103 compatible
- Low voltage
- Originate/Answer switch selectable

		List Price	Our Price
KTMURMM100	0 - 300 baud modem (2 lbs.)	$99.95	***$79.00***
KTCNOR2328F	RS232 cable		$19.95

THE LEMON™ SOURS SURGES!

NEW!
From
EPD
Electronic Protection Devices



The LEMON, LIME, ORANGE, and PEACH are solid state and EMI-RFI noise filters designed to protect all mini and micro computers, word processors, printers, disc drives, and other computer-controlled equipment that is plugged into an AC power line. There may be nothing more terrifying than to lose all of your software or data files due to a high voltage spike or noise from an adjacent elevator, air conditioner, or any other high powered equipment being operated in the nearby area. With a LEMON, LIME, ORANGE, or PEACH, you can be sure that the FRUITS of your computer labor will be protected from most voltage spikes and EMI-RFI interferences.

AC SURGE PROTECTORS

Part No.	Description	List Price	Our Price
KTEPDLEMON	6 outlet wall mount	$59.95	$44.95
KTEPDLIME	6 outlet 4½" cord w/power switch	89.50	$69.95

(Shipping Weight 4 lbs. each)

EMI-RFI FILTERED AC SURGE PROTECTOR

KTEPDORANGE	6 outlet 4½" cord w/power switch	$139.95	$104.95
KTEPDPEACH	3 outlet wall mount	$97.50	$ 74.95

(Shipping Weight 4 lbs. each)

DUAL 8" HALF HEIGHT FLOPPY CABINET

- 24V @ 4A, 5V @ 3A -5V @ 800ma
- Fan cooled
- Socketed power connections
- All supplies regulated

		List Price	Our Price
KTIIIOTL002	Dual Thin Line Cabinet (12 lbs.)	$225.00	$165.00

BUY THE CABINET & DRIVES AND $AVE!

With 2 Tandon Thinlines

KTPOBIIITN01	Cabinet w/2 TNDTM8481 - 1 sided (30 lbs.)	$ 885.00
KTPOBIIITN02	Cabinet w/2 TNDTM8482 - 2 sided (30 lbs.)	$1115.00

With 2 MPI Slimlines

KTPOBIIIMPI1	Cabinet w/2 MPI41M - 1 sided (30 lbs.)	$ 920.00
KTPOBIIIMPI2	Cabinet w/2 MPI42M - 2 sided (30 lbs.)	$1080.00

Options

KTIIIOTLMPIKIT	MPI drive adaptor mounting kit (2 lbs.)	$24.95
KTIIIOCCSHU	Shugart / AC/DC power connector kit (2 lbs.)	$14.95

(For full size single SA801 or compatible drives)

5¼" FLOPPY DISKETTES

DOUBLE DENSITY! ULTRA MAGNETICS ***LIFETIME WARRANTY!***

FEATURES:
- Includes reinforcement ring
- 100% Surface tested
- Write protect with tabs
- Lifetime warranty!

SINGLE SIDED

40 TRACKS — DOUBLE DENSITY

1 BOX OF 10: ***$ 25.00***

2 BOXES: ***$ 40.00***

10 BOXES: ***$180.00***

ORDERING INFORMATION
KTULT51401 Soft Sector
KTULT51410 10 Sector
KTULT51416 16 Sector

KTULT52401	Soft sector, 40 track, 2 sided	(Sh. Wt. 1 lb. per box)
KTULT52410	10 sector, 40 track, 2 sided	
KTULT52416	16 sector, 40 track, 2 sided	

1 BOX OF 10	2 BOXES	10 BOXES
$35.00	***$60.00***	***$280.00***

64K 10MHz LOW POWER S-100 IEEE STATIC RAMS

CompuPro -

RAM 17
64K 8 BIT 24 BIT ADDRESS
KTGBTRAM17 List Price $499.00
SALE: $299

RAM 16
64K 8 or 32K 16 BIT 24 BIT ADDRESS
KTGBTRAM16 List Price $550.00
SALE: $325

VISA

PRIORITY ONE ELECTRONICS

MasterCard

9161 Deering Ave., Chatsworth, CA 91311

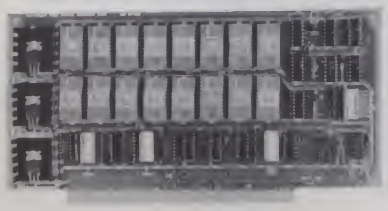
ORDER TOLL FREE (800) 423-5922 - CA, AK, HI CALL (213) 709-5111

Terms: U.S. VISA, MC, BAC, Check, Money Order, U.S. Funds Only. CA residents add 6½% Sales Tax. MINIMUM PREPAID ORDER $15.00. Include MINIMUM SHIPPING & HANDLING of $3.00 for the first 3 lbs. plus 40¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, include your phone number. Prices subject to change without notice. We will do our best to maintain prices through August, 1983. Many quantities are limited. Sorry, no rainchecks, no refunds or exchanges on sale merchandise. Credit Card orders will be charged appropriate freight. Sale prices for prepaid orders only. We are not responsible for typographical errors.

RETAIL STORE PHONE NUMBERS: (Chatsworth:) (213) 709-5464 - (IRVINE:) (714) 660-1411

DIGITAL RESEARCH COMPUTERS
(214) 271-3538

32K S-100 EPROM CARD
PRICE CUT!



$59.95

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES:
1. Uses +5V only 2716 (2Kx8) EPROM's
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed
7. Any or all EPROM locations can be disabled
8. Double sided PC board, solder-masked, silk-screened
9. Gold plated contact fingers
10. Unselected EPROM's automatically powered down for low power
11. Fully bufferrd and bypassed
12. Easy and quick to assemble

64K S100 STATIC RAM

$229.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $55

SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $199

ASSEMBLED AND TESTED ADD $50

FEATURES:
- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports IEEE 696 24 BIT Extended Addressing.
- ★ 64K draws only approximately 500 MA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- ★ 2716 EPROMs may be installed in any of top 48K.
- ★ Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- ★ Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- ★ BOARD may be partially populated as 56K.

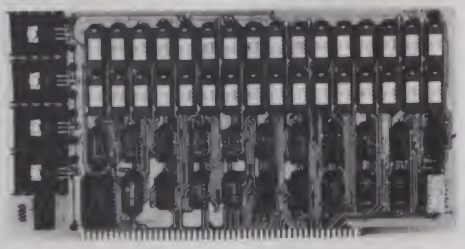
16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

$99.95 KIT

FOR 4MHZ ADD $5

PRICE CUT



KIT FEATURES:
1. Addressable as four separate 4K Blocks
2. ON BOARD BANK SELECT circuitry. (Cromemco Standard!). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams
4. ON BOARD SELECTABLE WAIT STATES
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers
6. All address and data lines fully buffered
7. Kit includes ALL parts and sockets
8. PHANTOM is jumpered to PIN 67
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-**$24**

LOW PROFILE SOCKET SET-**$9**

SUPPORT IC'S & CAPS-**$12.95**

ASSEMBLED & TESTED-**ADD $35**

OUR #1 SELLING RAM BOARD!

64K SS-50 STATIC RAM

$179.00 (48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD WITH DOCUMENTATION $52

SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $219

64K Kit $249

ASSEMBLED AND TESTED ADD $50

FEATURES:
- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports Extended Addressing.
- ★ 64K draws only approximately 500 MA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- ★ 2716 EPROMs may be installed anywhere on Board.
- ★ Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- ★ One Board supports both RAM and EPROM.
- ★ RAM supports 2MHZ operation at no extra charge!
- ★ Board may be partially populated in 16K increments.

STEREO! NEW!
S-100 SOUND COMPUTER BOARD

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

KIT FEATURES:
- ★ TWO GI SOUND COMPUTER IC'S.
- ★ FOUR PARALLEL I/O PORTS ON BOARD.
- ★ USES ON BOARD AUDIO AMPS OR YOUR STEREO.
- ★ ON BOARD PROTO TYPING AREA.
- ★ ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- ★ PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- ★ EASY, QUICK, AND FUN TO BUILD. WITH FULL INSTRUCTIONS.
- ★ USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language Programming examples are included.

COMPLETE KIT! **$59.95** (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $27.50

PRICE CUT!

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716. Diskette - **$24.95** 2708 - **$19.95** 2716 - **$29.95.** Diskette includes the source. EPROM'S are ORG at E000H. **(Diskette is 8 Inch Soft Sectored)**

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains: 3 Tone Channels, Noise Generator, 3 Channels of Amplitude Control, 16 bit Envelope Period Control, 2-8 Bit Parallel I/O, 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses. **$9.95** PRICE CUT!

SPECIAL OFFER: ~~$14.95~~ each Add $3 for 60 page Data Manual.

32K S100 EPROM/STATIC RAM

NEW! FOUR FUNCTION BOARD! **NEW!**

EPROM II FULL EPROM KIT $80.00

A&T EPROM ADD $35.00

BLANK PC BOARD WITH DATA $39.95

SUPPORT IC'S PLUS CAPS $23.00

FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:
- ★ This one board can be used in any one of four ways:
  - A. As a 32K 2716 EPROM Board
  - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
  - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
  - D. As a 32K Static RAM Board
- ★ Uses New 2K x 8 (TMM2016 or HM6116) RAM's
- ★ Fully Supports IEEE 696 Buss Standard (As Proposed)
- ★ Supports 24 Bit Extended Adressing
- ★ 200 NS (FAST!) RAM'S are standard on the RAM Kit
- ★ Supports both Cromemco and North Star Bank Select
- ★ Supports Phantom
- ★ On Board wait State Generator
- ★ Every 2K Block may be disabled
- ★ Addressed as two separate 16K Blocks on any 64K Boundary
- ★ Perfect for MP/M* Systems
- ★ RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $139.95
For RAM Kit A&T - Add $40

Digital Research Computers
P.O. BOX 461565 • GARLAND, TEXAS 75046 • (214) 271-3538

TERMS: Add $2.00 postage. We pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa and MasterCharge. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over $50, add 85¢ for insurance.

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

*TM OF DIGITAL RESEARCH INC. (CALIF.)

WE ARE NOT ASSOCIATED WITH DIGITAL RESEARCH INC. (CALIF.) THE SUPPLIERS OF CPM SOFTWARE

NEW LOWER PRICES

"THE ORIGINAL BIG BOARD"

OEM - INDUSTRIAL - BUSINESS - SCIENTIFIC

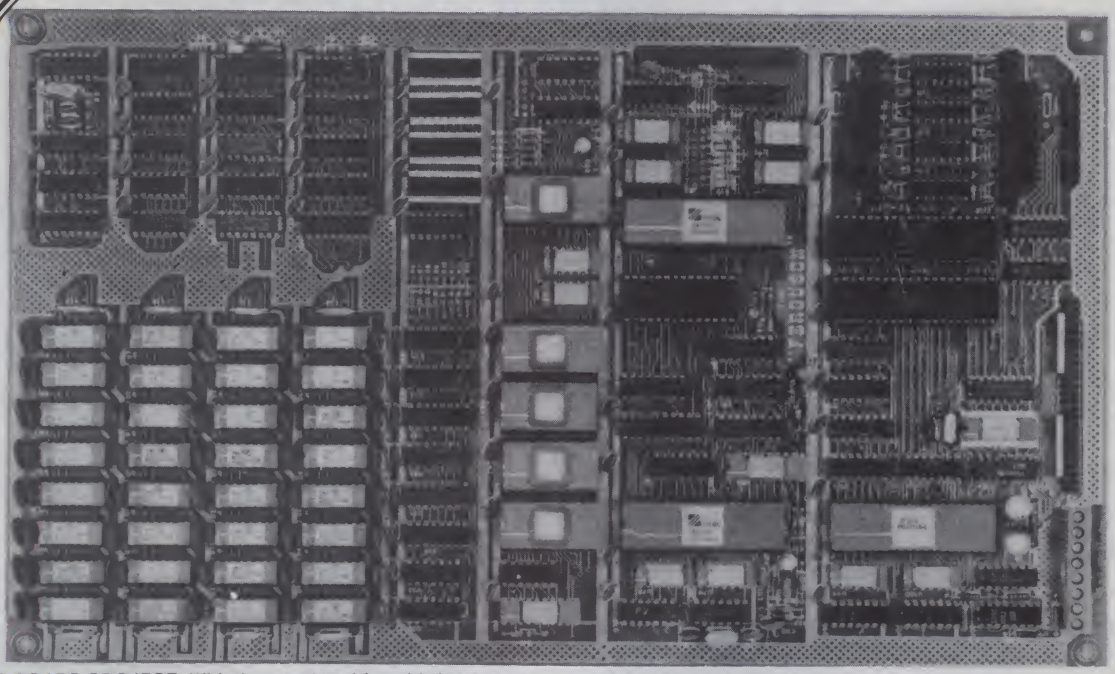
SINGLE BOARD COMPUTER KIT!

Z-80 CPU! 64K RAM!

(DO NOT CONFUSE WITH ANY OF OUR FLATTERING IMITATORS!)

NEW!

PARTIALLY ASSEMBLED KITS
For All Sockets Installed
And Soldered Add $50.
(Not For Blank PCB)



WANT MORE INFO?
Full Documentation and
Schematics — $5.

THE BIG BOARD PROJECT: With thousands sold worldwide and over two years of field experience, the Big Board may just be one of the most reliable single board computers available today. This is the same design that was licensed by Xerox Corp. as the basis for their 820 computer.

The Big Board gives you the right mix of most needed computing features all on one board. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed.

$319.00 ** (64K KIT BASIC I/O)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses industry standard 4116 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 int. Price for all parts and connectors: $39.95

BASIC I/O

Consists of separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

BLANK PC BOARD — $119

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

24 x 80 CHARACTER VIDEO

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Each month Microcomputing *will publish translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.*

Doctor Dementia's House of Doom program (February 1983) converted by Robert Black (100 St. Regis Drive, Newark, DE 19711) to run on the Commodore-64.

```
0 REM ************************************************************************
1 REM *                                                                      *
2 REM *  DR DEMENTIA MICROCOMPUTING FEB 83                                   *
3 REM *     CBM 64 BY  R.E.BLACK JR                                          *
4 REM *                100 ST REGIS DR                                       *
5 REM *                NEWARK DE 19711                                       *
6 REM *                                                                      *
7 REM ************************************************************************
8 REM *                                                                      *
9 REM *            LISTING COVENTIONS                                        *
10 REM*                                                                      *
11 REM*             CLEAR SCREEN   "□"                                       *
12 REM*             CURSOR HOME    "■"                                       *
13 REM*             CURSOR DOWN    "▼"                                       *
14 REM*             CURSOR RIGHT   "▶"                                       *
15 REM*             CURSOR BLACK   "■"                                       *
16 REM*             REVERSE ON     "■"                                       *
17 REM*             REVERSE OFF    "■"                                       *
18 REM*             SPACE          SPACE                                     *
19 REM*                                                                      *
20 REM************************************************************************
30 REM*                                                                      *
31 REM** VIC-20 PROGRAM WITH CHANGES TO OR ADDED STATEMENTS ******************
32 REM*  99,100,180,200-220,320-335,380-410,460-480,500-540,570-600,630-650   *
33 REM*  690-730,760,770,800-830,850-870,900-930,1000-1100                    *
34 REM*                                                                      *
35 REM************************************************************************
99 BX=49152 FORI=BXTOBX+10 POKEI,0 NEXT REM CLR SPACE FOR HI SCORES EACH TORTURE
100 GOSUB1000 GOTO460
110 C$="" E$=RIGHT$(STR$(J),1) FORI=1TOL B$=MID$(A$,I,1)
120 IFB$=E$THEN140
130 C$=C$+B$
140 NEXT
150 A$=C$ L=LEN(A$)
160 IFL=0THENRETURN
170 X=L*RND(0)+1 J=VAL(MID$(A$,X,1)) S(J)=HP+2*J+C*Y(J)+2
180 Q=PEEK(S(J)) POKEWF(1),NO+J POKEWF(1),129
190 IFPEEK(S(J)+C)<>32ANDY(J)+1<BTHENPOKES(J),F GOTO680
200 IF0=HTHENPOKES(J),F POKEWF(1),128 RETURN
210 IF0=FTHENY(J)=Y(J)+1 IFY(J)-BTHENPOKES(J)+C,H POKEWF(1),128 RETURN
220 GOSUB110 POKEWF(1),128 IFL=0THEN790
230 RETURN
240 IFP>LXTHENIFPEEK(P-2)=HANDPEEK(P-2)-FTHENPOKEP+1,32 P=P-1
250 GOTO270
260 IFP<RXTHENIFPEEK(P+2)=HANDPEEK(P+2)-FTHENPOKEP-1,32 P=P+1
270 IFP=LXTHENP0=173
280 IFP=RXTHENP2=171
290 IFP0=173THEN1FP2=171THENP1=185 P0=160 P2=160
300 POKEP-1,P0 POKEP,P1 POKEP+1,P2 RETURN
310 U=254-P1+P1-1 POKEP,P1 R=P-C
320 POKER-RA POKEWF(2),U POKEWF(2),17 U=U-1 R=R-C IFPEEK(R)=HORPEEK(R)=FTHEN350
330 IFP<HP-2THENPOKEP+C,32 FORI=1TO3 FOPJ=1TO10 POKEHF(2),5*J NEXTJ,I
335 IFP<HP-2THENPOKEWF(2),16 GOTO380
340 POKEP+C,32 GOTO320
350 POKEP,32 POKEP+C,32 J=INT((P-LX)/2) Y(J)=Y(J)-1 IFY(J)<>-1THEN380
360 GOSUB110 IFL=0THEN750
370 SC=SC+1000
380 POKEWF(2),16 RETURN
390 FORDF=1TODI JV=PEEK(56320)AND15 FB=-((PEEK(56320)AND16)=0) REM 7=L,11=R,1=F
400 IFJV=7THENGOSUB260
410 IFJV=11THENGOSUB240
420 IFFB=1ANDP1>176THENGOSUB310
430 CX=2+3*((-1)*IX)+1,2 IX=IX+1 POKEMI,CX POKEPL,CX
440 PRINT"■"TAB(22-LEN(STR$(SC)))"■",SC SC=SC+10 NEXTDF
450 GOSUB170 GOTO390
460 POKEBO,1 POKEBA,1 POKE646,11
470 PRINT"□■   I AM DOCTOR DEMENTIA  "
480 PRINT"■ OUT OF THE GOODNESS OF MY HEART,I GIVE  YOU A CHOICE OF TORTURE:"
500 PRINT"■■■■ FIRST  DEGREE  (1)"
510 PRINT"■ SECOND DEGREE  (2)"
520 PRINT"■ THIRD  DEGREE  (3)"
530 PRINT"■■■■          ■NOW CHOOSE! (1, 2, OR 3)■"
540 PRINT"■■■             USE JOY PORT # 2"
550 GETAA$ IFAA$=""THEN550
560 DI=VAL(AA$) ID=DI IFDI<10RDI>3THEN550
570 DI=4-DI HB=1024
580 CS=55296 EB=1085 HP=1104 P=1914 LX=P-9 RX=LX+19
590 CE=CS+22*40+22 MI=CS+22*40 PL=CE-1
600 NO=244 P0=160 P1=185 P2=160 H=126 F=97 PA=30 C=40 B=21
610 L=9 POKEBO,6 POKEBA,3 PRINT"□■■  ".
620 FORI=0TO8 Y(I)=0 PRINTCHR$(161)" ";NEXT
630 PRINT"■ ■", POKE1904,173 POKE1925,171
640 FORI=HBTOHB+21 POKEI,P2 NEXT
645 FORI=HB+40TOHB+61 POKEI,P2 NEXT POKEVL,15
650 BS(ID)=256*PEEK(BX+ID*ID)+PEEK(BX+ID*ID-1) PRINT"■■HI ";BS(ID),"■"
660 PRINTTAB(11)"■SCORE ".
670 FORI=CSTOCE POKEI,0 NEXT GOSUB300 A$="012345678" GOTO390
680 GOSUB870
690 PRINT"    ■■■  YOU WERE IMPALED!",
700 PRINT"■ BUT I SEE IT'S ONLY  A FLESH-WOUND!                              "     0
OSUB930
720 PRINT"■■■ DO YOU HAVE THE COURAGE TO ",
730 PRINT"■TRY AGAIN?  ■"
740 GOTO830
750 GOSUB870
760 PRINT"    ■■■■■            SO YOU WON! DARE YOU          " GOSUB930
770 PRINT"■              TRY IT AGAIN?              ■"
780 GOTO830
790 GOSUB870
800 PRINT"    ■■■■■  I VE GOT YOU TRAPPED!                    " GOSUB930
```

More

Listing continued.

```
810 PRINT"■■ DO YOU HAVE ENOUGH ";
820 PRINT"■NERVE TO PLAY AGAIN?■",
830 GETXX$:IFXX$="N"THENPOKE646,0:PRINT"□":GOSUB1000:END
840 IFXX$<>"Y"THEN830
850 IFSC>=BS(ID)THENBS(ID)=SC-10:HI=INT(BS(ID)/256):LO=BS(ID)-256*HI
855 IFSC>=BS(ID)THENPOKE(BX+ID*ID-1),LO:POKE(BX+ID*ID),HI
860 SC=0 GOSUB1000:GOTO460
870 POKEWF(1),128:POKEWF(2),16:PRINT"□■■";
880 FORI=1TO20:PRINT"■                              ■";:NEXT
890 PRINT"■                    ", PRINT"■■■■■";:FORJ=1TO2
900 FORJ=1TO2:PRINT"  ", FORI=1TO4
910 POKEHF(1),245:POKEWF(1),129:PRINT"HA! ";:FORK=1TO15:POKEVL,K
920 POKEHF(1),NO+K-7:NEXTK,I,J:POKEWF(1),128:POKEVL,0:RETURN
930 PRINT"■■■ YOUR SCORE WAS";SC:PRINT"HIGH SCORE FOR YOUR TORTURE LEVEL";BS(ID)
:RETURN
1000 REM**STARTUP SID,BORDER,& BACKGROUND REGISTERS **************************
1010 LC=54272:VL=LC+24:BO=53280:BA=BO+1
1020 FORMC=LCTOVL:POKEMC,0:NEXT
1030 LF(1)=LC:HF(1)=LC+1:WF(1)=LC+4
1040 AD(1)=LC+5:SR(1)=LC+6
1050 FORI=2TO3:LF(I)=LF(I-1)+7
1060 HF(I)=HF(I-1)+7:WF(I)=WF(I-1)+7
1070 AD(I)=AD(I-1)+7:SR(I)=SR(I-1)+7:NEXTI:IFXX$="N"THENPETURN:REM** QUIT!*****
1080 REM** SETUP SOUNDS ** VOICE1= NOISE ** VOICE2= SOUND ********************
1090 POKEAD(1),15:POKESR(1),133:POKELF(1),200
1100 POKEAD(2),7:POKESR(2),133:POKELF(2),128:RETURN
```

Program conversion of the Bookshelf Database program (November 1982 Microcomputing, *p. 69) for the Heath/Zenith computers. By Raymond Abbitt, 370 Appian Way, Union City, CA 94587.*

```
5  '************************************************************
10 'BOOK DATA BASE FILED BY AUTHOR
12 'BY Linda M. McKinnon
13 'Courtland Ave. RFD#3
14 'Manchester, NH. 03103
15 'From MICROCOMPUTING, November 1982
16 '************************************************************
17 'Converted and Modified for HDOS MBASIC
18 'BY Ray Abbitt
19 '370 Appian Way
20 'Union City, Ca. 94587
21 '************************************************************
22 'MAXIMUM NUMBER OF ENTRIES CHANGED TO 200
23 'DUMMY RECORD ADDED (ACCENSION NUMBER 0) TO ALLOW DELETION OF ANY ENTRY
24 'SUBROUTINE AT 5000 ADDED TO CORRECT PRINTOUT IF AUTHOR IS EDITED
25 'RECORDS STORED AT I+1    IE N(1)=2
26 '************************************************************
50 CLEAR 5000
100 DIM AU$(200),TI$(200),PU$(200),YR$(200),IS$(200),CA$(200)
105 DIM N(200)
110 DIM LC$(200),K1$(200),K2$(200),K3$(200),LX(200),RX(200)
120 AU$(1)="MMMMMMM~~":J=1
150 PRINT CHR$(27);"E"
160 PRINT "ARE YOU CREATING A NEW FILE? (Y/N)";
170 Q$=INPUT$(1):PRINT Q$:INPUT"FILENAME? (CR)";FI$
180 IF Q$="y" OR Q$="Y" THEN 212
190 OPEN "I",1,FI$
195 INPUT #1,R,J
196 FOR I=1 TO J+1
197 INPUT #1,N(I),AU$(I),TI$(I),PU$(I),YR$(I),IS$(I),CA$(I),LC$(I)
198 INPUT #1,K1$(I),K2$(I),K3$(I),LX(I),RX(I)
199 NEXT I
200 CLOSE 1
212 PRINT CHR$(27);"E"
215 X$="BOOKSHELF DATA BASE"
217 PRINT TAB(20-(LEN(X$))/2);X$: PRINT: PRINT: PRINT
220 PRINT TAB(10);"1-BOOK INPUT MODE"
230 PRINT TAB(10);"2-LIST ALL BOOKS"
240 PRINT TAB(10);"3-DELETE A BOOK"
245 PRINT TAB(10);"4-EDIT A CITATION"
250 PRINT TAB(10);"5-SEARCH DATA BASE"
260 PRINT TAB(10);"6-SAVE BOOKSHELF & CONTINUE"
262 PRINT TAB(10);"7-QUIT AND UPDATE BOOKSHELF"
270 PRINT:PRINT:PRINT
275 PRINT"ENTER OPTION";QQ=VAL(INPUT$(1))
280 IF QQ < 1 OR QQ > 7 THEN 275
290 ON QQ GOSUB 400,1000,2000,3000,4000,8000,8000
300 IF QQ <> 7 THEN 212
310 END
400 REM  BOOK INPUT MODE SUBROUTINE
405 X$="BOOK INPUT MODE"
410 PRINT CHR$(27);"E":PRINT TAB(20-(LEN(X$))/2);X$:PRINT:PRINT
420 R = R + 1:J = J + 1
430 I = 1: REM  SEARCH AT ROOT NODE
435 PRINT"FOLLOW ALL ENTRIES WITH A CARRIAGE RETURN":PRINT "ACC #: ";J-1
440 INPUT "AUTHOR:   ";A1$:   IF LEN(A1$)<1 THEN 440
450 INPUT "TITLE:    ";T1$:   IF LEN(T1$)<1 THEN 450
460 INPUT "PUBLISH:  ";P1$:   IF LEN(P1$)<1 THEN 460
470 INPUT "YEAR:     ";Y1$:   IF LEN(Y1$)<1 THEN 470
480 INPUT "ISBN:     ";I1$:   IF LEN(I1$)<1 THEN 480
482 INPUT "CAT NO:   ";C1$:   IF LEN(C1$)<1 THEN 482
484 INPUT "LC NO:    ";L1$:   IF LEN(L1$)<1 THEN 484
490 INPUT "KEYWORD 1";KA$:   IF LEN(KA$)<1 THEN 490
500 INPUT "KEYWORD 2";KB$:   IF LEN(KB$)<1 THEN 500
510 INPUT "KEYWORD 3";KC$:   IF LEN(KC$)<1 THEN 510
520 IF A1$>AU$(I) THEN 730 'REM SEARCH RIGHT BRANCH
530 GOTO 580 'REM ELSE SEARCH LEFT BRANCH
540 PRINT "PRESS RETURN TO CONTINUE"
550 Q$=INPUT$(1):IF Q$<>CHR$(13) THEN 550
560 RETURN
580 REM SEARCH LEFT BRANCH SUBROUTINE(IF IT ISN'T FULL)
590 IF LX(I) <> 0 THEN I =LX(I):GOTO 520
600 REM  ADD NEW LEFT LINK
610 LX(I)=J
615 N(J)=J-1
620 AU$(J)=A1$: 'ADD NEW RECORD
630 TI$(J)=T1$
640 PU$(J)=P1$
650 YR$(J)=Y1$
652 IS$(J)=I1$
654 CA$(J)=C1$
```

More

Listing continued.

```
656 LC$(J)=L1$
660 K1$(J)=KA$
680 K2$(J)=KB$
690 K3$(J)=KC$
700 LX(J)=0
710 RX(J)=0
720 GOTO540
730 REM  SEARCH RIGHT BRANCH IF NOT FULL
740 IF RX(I) <> 0 THEN I=RX(I):GOTO520
760 REM ADD RIGHT NODE
770 RX(I)=J
775 N(J)=J-1
780 AU$(J)=A1$
790 TI$(J)=T1$
800 PU$(J)=P1$
810 YR$(J)=Y1$
820 IS$(J)=I1$
824 CA$(J)=C1$
826 LC$(J)=L1$
830 K1$(J)=KA$
840 K2$(J)=KB$
850 K3$(J)=KC$
860 RX(J)=0
870 LX(J)=0
880 GOTO540
1000 REM  LIST ALL BOOKS SUBROUTINE
1010 P=1:T=0:PRINT CHR$(27);"E" 'REM INITIALIZE VARIABLES
1020 PRINT"DO YOU WANT A HARD COPY (Y/N)?";:QQ$=INPUT$(1):IF QQ$="Y" OR QQ$="y"@
     THEN QQ=1 ELSE IF QQ$="N" OR QQ$="n" THEN QQ=0
1021 IF QQ=1 THEN OPEN "O",2,"LP:"
1022 IF QQ=0 THEN OPEN "O",2,"TT:"
1030 PRINT CHR$(27);"E"
1040 T=T+1
1050 SX(T)=P  'REM PUSH ON STACK
1060 IF P<>0 THEN P=LX(P):GOTO 1040
1070 T=T-1
1080 IF T<0 THEN CLOSE 2:PRINT "ALL BOOKS LISTED"
1081 IF T<0 THEN PRINT"PRESS C TO CONTINUE":A$=INPUT$(1):IF A$="C" OR A$="c" @
     THEN RETURN ELSE 1081
1090 P=SX(T)  'REM POP THE STACK
1100 X$="LIST ALL BOOKS MODE"
1103 IF N(P)=0 THEN GOTO1170
1105 PRINT TAB(20-(LEN(X$))/2);X$
1110 PRINT:PRINT:PRINT
1112 PRINT #2,"AC #: ";N(P)
1115 PRINT #2,"AU:   ";AU$(P)
1118 PRINT #2,"TI:   ";TI$(P):PRINT #2,"PU:   ";PU$(P)
1120 PRINT #2,"YR:   ";YR$(P):PRINT #2,"IS:   ";IS$(P)
1122 PRINT #2,"CAT:  ";CA$(P):PRINT #2,"LI:   ";LC$(P)
1125 PRINT #2,"KEY1: ";K1$(P):PRINT #2,"KEY2: ";K2$(P)
1130 PRINT #2,"KEY3: ";K3$(P)
1140 PRINT #2,CHR$(13),CHR$(13),CHR$(13)
1150 IF QQ=0 THEN CLOSE 2 ELSE 1170
1151 PRINT "PRESS C TO SEE THE NEXT CITATION"
1152 A$=INPUT$(1):IF A$<>"C" AND A$<>"c" THEN 1151
1153 OPEN "O",2,"TT:"
1160 PRINT CHR$(27);"E"
1170 T=T-1
1180 P=RX(P)
1190 GOTO 1040
2000 REM  DELETE A BOOK SUBROUTINE
2004 REM  RTEMP AND LTEMP ARE POINTERS TO RECORD WE WANT TO DELETE
2005 RTEMP=0:LTEMP=0
2010 PRINT CHR$(27);"E"
2020 X$="DELETE A BOOK MODE"
2030 PRINT TAB(20-(LEN(X$))/2);X$:PRINT:PRINT
2040 INPUT "ACCESSION NO. TO BE DELETED: (CR)";DLTE:DLTE=DLTE+1
2050 IF(N(DLTE)<1) OR (N(DLTE)>J) THEN PRINT"ACCESSION NUMBER NOT IN DATA BASE"@
     :PRINT"TRY AGAIN":GOTO 2040
2080 PRINT : I=1 :REM START AT BEGINNING OF TREE
2085 AS$="**********************":PRINT AS$;AS$;AS$;AS$
2090 IF AU$(DLTE)>AU$(I)THEN2360
2095 IF AU$(DLTE)<AU$(I)THEN2340
2096 IF N(DLTE)<>N(I) THEN 2360
2097 REM RECORD FOUND
2098 PRINT "AC#:  ";N(I)
2100 PRINT"AU:   ";AU$(I)
2110 PRINT"TI:   ";TI$(I)
2120 PRINT"PU:   ";PU$(I)
2130 PRINT"YR:   ";YR$(I)
2140 PRINT"IS:   ";IS$(I)
2150 PRINT"CAT:  ";CA$(I)
2160 PRINT"LC:   ";LC$(I)
2170 PRINT"KEY1: ";K1$(I)
2180 PRINT"KEY2: ";K2$(I)
2190 PRINT"KEY3: ";K3$(I)
2194 PRINT
2195 PRINT AS$;AS$;AS$;AS$
2200 PRINT"DO YOU WANT TO DELETE THIS ITEM FROM THE DATABASE? (Y/N)";:@
     A$=INPUT$(1)
2202 IF A$="N" OR A$="n" THEN 2330
2205 IF A$<>"Y" AND A$<>"y" THEN 2200
2210 REM LOOK UP NODE PTRS-LTEMP OR RTEMP ARE POINTERS TO N(DLTE)
2220 IF RTEMP<>0 THEN RX(RTEMP)=RX(DLTE):GOTO 2230
2222 REM  IF RTEMP=0 THEN LTEMP POINTS TO N(DLTE)
2224 IF LTEMP<>0 THEN LX(LTEMP)=LX(DLTE):GOTO 2270
2230 I=1: REM RECORD GETS ENTERED AGAIN
2232 IF AU$(LX(DLTE)) >= AU$(LX(I)) THEN 2242
2234 REM  SEARCH LEFT BRANCH
2236 IF LX(I)<>0 THEN I=LX(I): GOTO 2232
2238 REM  ADD NEW LINK
2240 LX(I)=LX(DLTE):GOTO 2300
2242 REM  SEARCH RIGHT BRANCH
2244 IF RX(I)<>0 THEN I=RX(I):GOTO 2232
2246 REM  ADD NEW LINK
2248 RX(I)=LX(DLTE):GOTO 2300
2270 I=1: REM  RECORD GETS REENTERED
2272 IF AU$(RX(DLTE)) >= AU$(I) THEN 2282
2274 REM SEARCH LEFT BRANCH
2276 IF LX(I)<>0 THEN I=LX(I):GOTO 2272
2278 REM  ADD NEW LINK
2280 LX(I)=RX(DLTE):GOTO 2300
2282 REM  SEARCH RIGHT BRANCH
2284 IF RX(I)<>0 THEN I = RX(I):GOTO 2272
2286 REM  ADD NEW LINK
2290 RX(I)=RX(DLTE)
2300 PRINT:PRINT:PRINT"ACCESSION ";N(DLTE);" HAS BEEN DELETED"
2305 R=R-1
2310 PRINT"PRESS C TO CONTINUE":A$=INPUT$(1):IF A$="C" OR A$="c" THEN 212
2330 RETURN
2340 REM  SEARCH LEFT SIDE OF TREE FOR RECORD AND POINTER TO RECORD
2350 IF LX(I)<>0 THEN IF LX(I)<>(DLTE) THEN I=LX(I):GOTO 2090
2351 IF LX(I)=(DLTE)THEN LTEMP=I:I=LX(I):GOTO 2090
2352 IF LX(I)=0 THEN PRINT "BOOK NOT IN DATA BASE"
2355 PRINT"PRESS C TO CONTINUE":A$=INPUT$(1):IF A$="C" OR A$="c" THEN 212
2360 REM  SEARCH RIGHT SIDE OF TREE FOR POINTER TO RECORD AND FOR RECORD
2370 IF RX(I)<>0 THEN IF RX(I)<>(DLTE) THEN I=RX(I):GOTO 2090
2372 IF RX(I)=(DLTE) THEN RTEMP=I:I=RX(I):GOTO 2090
2380 IF RX(I)=0 THEN GOTO 2352
3000 REM      EDIT A BOOK SUBROUTINE
3003 REM  RTEMP AND LTEMP ARE POINTERS TO RECORD WE WANT TO EDIT
3006 RTEMP=0:LTEMP=0
3010 PRINT CHR$(27);"E"
3020 X$="EDIT A BOOK MODE"
3030 PRINT TAB(20-(LEN(X$))/2);X$:PRINT:PRINT
3040 INPUT"ACCESSION NO. TO EDIT: (CR)";ED: ED=ED+1
```

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Listing continued.

```
3050 IF (N(ED)<1) OR (N(ED)>J) THEN PRINT "ACCESSION NUMBER NOT IN DATA BASE"@
     ;PRINT "TRY AGAIN":GOTO3040
3080 PRINTI=1:  REM SEARCH AT BEGINNING OF TREE
3090 IF AU$(ED)>AU$(I) THEN 3360
3100 IF AU$(ED)<AU$(I) THEN 3340
3103 IF N(ED)<>N(I) THEN 3340
3105 REM  RECORD FOUND AND POINTERS SET
3110 PRINT"IF ITEM IS NOT TO BE CHANGED PRESS RETURN"
3112 PRINT"PRESS RETURN AFTER ALL ENTRIES"
3115 PRINT TAB(15);"**********"
3120 PRINT"ACC #:";N(I)
3130 PRINT"OLD AUTHOR:";AU$(I);Q1$=""
3140 INPUT"NEW AUTHOR:";Q1$:IF Q1$<>"" THEN AU$(I)=Q1$:Q1$="" ELSE 3150
3145 GOSUB 5000
3150 PRINT"OLD TITLE:";TI$(I)
3160 INPUT"NEW TITLE:";Q1$:IF Q1$<>"" THEN TI$(I)=Q1$:Q1$=""
3170 PRINT"OLD PUBLISHER:";PU$(I)
3180 INPUT"NEW PUBLISHER:";Q1$:IF Q1$<>"" THEN PU$(I)=Q1$:Q1$=""
3190 PRINT"OLD YEAR:";YR$(I)
3200 INPUT"NEW YEAR:";Q1$:IF Q1$<>"" THEN YR$(I)=Q1$:Q1$=""
3210 PRINT"OLD ISBN:";IS$(I)
3220 INPUT"NEW ISBN:";Q1$:IF Q1$<>"" THEN IS$(I)=Q1$:Q1$=""
3230 PRINT"OLD CATALOG:";CA$(I)
3240 INPUT"NEW CATALOG:";Q1$:IF Q1$<>"" THEN CA$(I)=Q1$:Q1$=""
3250 PRINT"OLD LIBRARY CONG#:";LC$(I)
3260 INPUT"NEW LIBRARY CONG#:";Q1$:IF Q1$<>"" THEN LC$(I)=Q1$:Q1$=""
3270 PRINT"OLD KEY 1:";K1$(I)
3280 INPUT"NEW KEY 1:";Q1$:IF Q1$<>"" THEN K1$(I)=Q1$:Q1$=""
3290 PRINT"OLD KEY 2:";K2$(I)
3300 INPUT"NEW KEY 2:";Q1$:IF Q1$<>"" THEN K2$(I)=Q1$:Q1$=""
3310 PRINT"OLD KEY 3:";K3$(I)
3320 INPUT"NEW KEY 3:";Q1$:IF Q1$<>"" THEN K3$(I)=Q1$:Q1$=""
3330 RETURN
3340 REM  SEARCH THE LEFT SIDE OF TREE
3350 IF LX(I)<>0 THEN IF LX(I)<>(ED) THEN I=LX(I):GOTO 3090
3351 IF LX(I)=(ED) THEN LTEMP=I:I=LX(I):GOTO 3090
3352 IF LX(I)=0 THEN PRINT "BOOK NOT IN DATA BASE"
3355 PRINT"PRESS C TO CONTINUE":A$=INPUT$(1):IF A$="C" OR A$="c" THEN 212
3360 REM  SEARCH THE RIGHT SIDE OF TREE
3370 IF RX(I)<>0 THEN IF RX(I)<>(ED) THEN I=RX(I):GOTO 3090
3372 IF RX(I)=(ED) THEN RTEMP=I:I=RX(I):GOTO 3090
3380 IF RX(I)=0 THEN GOTO 3352
4000 REM  SEARCH DATA BASE MODE SUBROUTINE
4005 QQ=0
4010 PRINT CHR$(27);"E"
4020 X$="SEARCH DATA BASE MODE"
4030 PRINT TAB(20-(LEN(X$))/2);X$:PRINT:PRINT
4040 PRINT TAB(10);"SEARCH SELECTION:":PRINT
4050 PRINT TAB(12);"1..AUTHOR"
4060 PRINT TAB(12);"2..TITLE"
4070 PRINT TAB(12);"3..PUBLISHER"
4075 PRINT TAB(12);"4..SUBJECT"
4080 PRINT TAB(12);"5..EXIT SEARCH MODE"
4085 PRINT:PRINT:PRINT
4087 P=1:T=0 'REM INITIALIZE VARIABLES
4090 PRINT"SELECTION?":Q=VAL(INPUT$(1)):IF Q<1 OR Q>5 THEN 4090
4200 IF Q=5 THEN RETURN
4220 INPUT"SEARCH QUERY: (CR)";Q1$
4300 IF QQ=0 THEN PRINTCHR$(27);"E"
4310 PRINT"DO YOU WANT A HARD COPY (Y/N)?";:QQ$=INPUT$(1):IF QQ$="Y" OR QQ$="y"@
     THEN QQ=1 ELSE IF QQ$="N" OR QQ$="n" THEN QQ=0
4311 IF QQ=1 THEN OPEN "O",2,"LP:"
4312 IF QQ=0 THEN OPEN "O",2,"TT:"
4320 PRINTCHR$(27);"E"
4330 T=T+1
4340 SX(T)=P 'REM PUSH ON STACK
4350 IF P<>0 THEN P=LX(P):GOTO 4330
4360 T=T-1
4370 IF T<=0 THEN CLOSE 2:PRINTCHR$(27);"E";"SEARCH COMPLETED - ALL ITEMS@
     SEARCHED":PRINT:PRINT"PRESS C TO CONTINUE":A$=INPUT$(1):@
     IF A$="c" OR A$="C" THEN 4010
4380 P=SX(T)  'REM  POP STACK
4385 ON Q GOTO 4600,4610,4620,4630
4410 PRINT TAB(20-(LEN(X$))/2);X$:
4420 PRINT:PRINT:PRINT
4430 PRINT #2,"AC #:";N(P)
4440 PRINT #2,"AU:  ";AU$(P)
4445 PRINT #2,"TI:  ";TI$(P)
4450 PRINT #2,"PU:  ";PU$(P)
4460 PRINT #2,"YR:  ";YR$(P)
4470 PRINT #2,"IS:  ";IS$(P)
4480 PRINT #2,"CAT: ";CA$(P)
```

More

Listing continued.

```
4490 PRINT #2,"LC:  ";LC$(P)
4500 PRINT #2,"KEY1:";K1$(P)
4510 PRINT #2,"KEY2:";K2$(P):PRINT #2,"KEY3:";K3$(P)
4520 PRINT #2,CHR$(13);CHR$(13);CHR$(13)
4530 IF QQ=0 THEN CLOSE 2 ELSE 4550
4531 PRINT "PRESS C TO SEE THE NEXT ITEM"
4532 A$=INPUT$(1):IF A$<>"C" AND A$<>"c" THEN 4531
4533 OPEN "O",2,"TT:"
4540 PRINT CHR$(27);"E"
4550 T=T-1
4560 P=RX(P)  'REM  CHECK AGAINST RIGHT BRANCH
4570 GOTO 4330
4600 IF RIGHT$(Q1$,1)="?"@
     THEN IF LEFT$(Q1$,(LEN(Q1$)-1))=LEFT$(AU$(P),(LEN(Q1$)-1))@
     THEN 4410
4602 IF Q1$<>AU$(P) THEN 4550
4605 GOTO 4410
4610 IF RIGHT$(Q1$,1)="?"@
     THEN IF LEFT$(Q1$,(LEN(Q1$)-1))=LEFT$(TI$(P),(LEN(Q1$)-1))@
     THEN 4410
4612 IF Q1$<>TI$(P) THEN 4550
4615 GOTO 4410
4620 IF RIGHT$(Q1$,1)="?"@
     THEN IF LEFT$(Q1$,(LEN(Q1$)-1))=LEFT$(PU$(P),(LEN(Q1$)-1))@
     THEN 4410
4621 IF Q1$<>PU$(P)THEN 4550
4622 GOTO 4410
4630 ZK$=LEFT$(Q1$,(LEN(Q1$)-1)):ZX$=LEFT$(K1$(P),LEN(Q1$)-1)
4631 ZY$=LEFT$(K2$(P),LEN(Q1$)-1):ZZ$=LEFT$(K3$(P),LEN(Q1$)-1)
4632 IF RIGHT$(Q1$,1)="?" THEN IF (ZK$=ZX$) OR (ZK$=ZY$) OR (ZK$=ZZ$) THEN 4410
4634 IF Q1$<>K1$(P) AND Q1$<>K2$(P) AND Q1$<>K3$(P) THEN 4550
4635 GOTO4410
5000 REM  SUBROUTINE TO CHANGE LINKS IF AUTHOR IS EDITED
5005 REM  ADDED AS PART OF CONVERSION TO HDOS MBASIC
5010 REM LOOK UP NODE PTRS-LTEMP OR RTEMP ARE POINTERS TO N(ED)
5020 IF RTEMP<>0 THEN RX(RTEMP)=RX(ED):GOTO 5030
5022 REM IF RTEMP=0 THEN LTMP POINTS TO N(ED)
5024 IF LTEMP<>0 THEN LX(LTEMP)=LX(ED):GOTO 5070
5030 I=1: REM RECORD GETS ENTERED AGAIN
5032 IF AU$(LX(ED)) >= AU$(LX(I)) THEN 5042
5034 REM  SEARCH LEFT BRANCH
5036 IF LX(I)<>0 THEN I=LX(I): GOTO 5032
5038 REM  ADD NEW LINK
5040 LX(I)=LX(ED):GOTO5100
5042 REM  SEARCH RIGHT BRANCH
5044 IF RX(I)<>0 THEN I=RX(I):GOTO 5032
5046 REM  ADD NEW LINK
5048 RX(I)=LX(ED):GOTO 5100
5070 I=1:  REM  RECORD GETS REENTERED
5072 IF AU$(RX(ED)) >= AU$(I) THEN 5082
5074 REM  SEARCH LEFT BRANCH
5076 IF LX(I)<>0 THEN I=LX(I):GOTO5072
5078 REM  ADD NEW LINK
5080 LX(I)=RX(ED):GOTO 5100
5082 REM  SEARCH RIGHT BRANCH
5084 IF RX(I)<>0 THEN I = RX(I):GOTO 5072
5086 REM  ADD NEW LINK
5090 RX(I)=RX(ED)
5100 REM  RECORD HAS BEEN DELETED--NOW MUST BE REENTERED IN CORRECT ORDER
5105 RX(ED)=0:LX(ED)=0
5110 I=1  'REM  SEARCH AT ROOT NODE
5120 IF AU$(ED) >= AU$(I) THEN 5300'  REM  SEARCH RIGHT BRANCH
5200 REM      SEARCH LEFT BRANCH
5210 IF LX(I)<>0 THEN I=LX(I):GOTO 5120
5220 REM  ADD NEW LEFT LINK
5230 LX(I)=ED
5240 I=ED:RETURN
5300 REM   SEARCH RIGHT BRANCH
5310 IF RX(I)<>0 THEN I=RX(I):GOTO 5120
5320 REM  ADD NEW RIGHT LINK
5330 RX(I)=ED
5340 I=ED:RETURN
8000 REM  WRITE NEW RECORDS SUBROUTINE
8020 OPEN "O",1,FI$
8040 PRINT #1,R;J
8050 FOR I = 1 TO J+1
8055 PRINT #1,N(I)
8060 PRINT #1,AU$(I);","TI$(I);","PU$(I);","YR$(I);","IS$(I)
8070 PRINT #1,CA$(I);","LC$(I);","K1$(I);","K2$(I);","K3$(I)
8080 PRINT #1,LX(I);RX(I)
8090 NEXT I
8100 CLOSE 1
8110 RETURN
```


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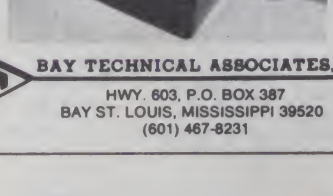

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READER SERVICE

This card valid until September 30, 1983

My vote for the best advertisement in this issue goes to _____ (company) whose Reader Service number is _____.

A. Which microcomputing systems do you own? Check all that apply.

- ☐ 1. Apple II, II +, III
- ☐ 2. Apple IIe
- ☐ 3. Atari 400, 800
- ☐ 4. Atari 1200 XL
- ☐ 5. Commodore VIC-20
- ☐ 6. Commodore-64
- ☐ 7. Commodore/PET
- ☐ 8. Cromemco
- ☐ 9. DEC
- ☐ 10. Franklin Ace
- ☐ 11. Heath/Zenith
- ☐ 12. Hewlett-Packard
- ☐ 13. IBM PC
- ☐ 14. Kaypro
- ☐ 15. NEC
- ☐ 16. North Star
- ☐ 17. Osborne
- ☐ 18. PMC 80/81
- ☐ 19. S-100 based system
- ☐ 20. Sanyo
- ☐ 21. Texas Instruments
- ☐ 22. Timex/Sinclair
- ☐ 23. TRS-80
- ☐ 24. Xerox
- ☐ 25. Other _____

Which of the following systems do you plan to buy during the next 12 months?

- ☐ 26. Apple Lisa
- ☐ 27. Apple IIe
- ☐ 28. Atari 1200 XL
- ☐ 29. Commodore-64
- ☐ 30. Compaq
- ☐ 31. Epson HX-20
- ☐ 32. Epson QX-10
- ☐ 33. Franklin Ace
- ☐ 34. Hyperion
- ☐ 35. IBM XT PC
- ☐ 36. Morrow Micro Decision
- ☐ 37. North Star Advantage
- ☐ 38. Osborne Executive
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- ☐ 40. Panasonic JR-200
- ☐ 41. Sony SMC 70
- ☐ 42. Texas Instruments Compact
- ☐ 43. Texas Instruments Professional
- ☐ 44. Timex/Sinclair 2000
- ☐ 45. TRS-80 Model 12
- ☐ 46. TRS-80 Model 16
- ☐ 47. Tandy Model 100
- ☐ 48. Zenith 100
- ☐ 49. Zorba
- ☐ 50. Other _____

B. How much have you invested in computer hardware (including peripherals) during the last 12 months?

- ☐ 1. Nothing
- ☐ 2. Under $500
- ☐ 3. $500–$1,000
- ☐ 4. $1,000–$1,500
- ☐ 5. $1,500–$2,000
- ☐ 6. Over $2,000

C. How much do you plan to spend on computer hardware during the next 12 months?

- ☐ 1. Nothing
- ☐ 2. Under $500
- ☐ 3. $500–$1,000
- ☐ 4. $1,000–$1,500
- ☐ 5. $1,500–$2,000
- ☐ 6. Over $2,000

D. How much have you invested in computer software during the last 12 months?

- ☐ 1. Nothing
- ☐ 2. Less than $100
- ☐ 3. $100–$250
- ☐ 4. $250–$500
- ☐ 5. $500–$1,000
- ☐ 6. Over $1,000

E. How much do you plan to spend on software during the next 12 months?

- ☐ 1. Nothing
- ☐ 2. Less than $100
- ☐ 3. $100–$250
- ☐ 4. $250–$500
- ☐ 5. $500–$1,000
- ☐ 6. Over $1,000

F. Do you influence friends or business associates' purchases of computing equipment?

- ☐ 1. Yes ☐ 2. No

G. What do you consider the *best* source of information about computers? Check one only.

- ☐ 1. Computer magazines
- ☐ 2. Other magazines
- ☐ 3. Newspapers
- ☐ 4. Books
- ☐ 5. Seminars/courses
- ☐ 6. Word of mouth
- ☐ 7. Other _____

H. If you use a microcomputer at work, what is your primary application?

- ☐ 1. Word Processing
- ☐ 2. Database Management
- ☐ 3. Other Business
- ☐ 4. Home Finance/Household
- ☐ 5. Education
- ☐ 6. Scientific/Technical
- ☐ 7. Programming/Data Processing
- ☐ 8. Hardware Design
- ☐ 9. Graphics
- ☐ 10. Other _____

I. For the most part, the articles in *Microcomputing* are

- ☐ 1. Too simple
- ☐ 2. Too complex
- ☐ 3. Just right

L. Which of the following columns do you read? Please rate them on a scale of 1 (seldom read) to 5 (always read).

- ___ 1. Publisher's Remarks
- ___ 2. What's New, Big Blue?
- ___ 3. Dial-up Directory
- ___ 4. PET-pourri
- ___ 5. Micro Software Digest
- ___ 6. Conversions
- ___ 7. Book Reviews
- ___ 8. New Software
- ___ 9. New Products
- ___ 10. Software Reviews

M. If you are not a subscriber, please circle 500.

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A Hard Look at Applesoft
Making Sense of 6502 Assembly Language
Worthwhile Word Processing Principles
A 76-Program Parade for IBM Users
Fearless Advice on Buying Micros

The Elementary Apple

William B. Sanders
Datamost, 1983
9748 Cozycroft Ave.
Chatsworth, CA 91311
Softcover, 208 pp., $14.95

The title of this book is a paradox. *The Elementary Apple* is elementary; you start at a logical beginning and cover nearly everything Applesoft has to offer in an easy, understandable manner. But the depth of coverage is far from elementary. On the contrary, just about anything you want or need to know about Basic and your Apple is included.

As you leaf through the book, the paradox becomes more evident. It sounds like it should be a simple primer on how to use your Apple, but you'll find—on almost every page—a brief program or two. (I stopped counting them when the programs totaled more than 100.) That's where the real strength and value of the book lie.

Author William B. Sanders knows what he's doing. He doesn't just explain a function; he illustrates how that function works. Anyone can describe how Home and Text and Input operate; it's more important to come up with real-world examples—programs that *show* you what happens when you use the Basic commands.

The Elementary Apple covers all of the basics, including the special keys on the Apple II (it was written before the IIe came out). It even starts right where it should—with the Print instruction. It also offers worthwhile advice on how to edit programs and how to cope with mathematical precedence.

When Sanders explains variables, for instance, both his description and program are simple and helpful. "The significant feature of variables," he writes, "is that they 'vary' (change depending on what your program does)."

Sanders is perhaps a shade on the weak side when he covers For . . . Next loops; there's no real direction to the example and program, so they don't help a whole lot. He notes that a lot of programmers use "I" as a counter in loops and explains that they do so because "I" stands for Increment.

> Just about anything you need to know about Basic and Apple is included in *The Elementary Apple.*

One of the more complex areas of programming—arrays—gets good treatment from Sanders and serves as an excellent example of how he does things. When he covers multidimension arrays, you input the dimension parameters, and the sample program dimensions the array to your specifications. This is sort of "snuck" into things, but it helps you understand what happens without a lot of extra detail.

Sanders offers information on on-screen formatting and how to work with strings. He also takes a brief look at ASCII codes and Peek and Poke. He touches on Binary files, and he has some terrific work with graphics—simple, short programs that draw circles or create little bar charts—all in a few understandable program lines. You're taught how to create movement in the things you draw and how to "toggle" between hi-res screens #1 and #2.

Both high- and low-resolution graphics are covered, along with how to save and load them. Sanders even includes a couple of recommendations on what to buy to print your hi-res pictures.

The Elementary Apple isn't perfect, although I had to dig to find anything that wasn't right. You're told to pronounce DOS as "das." The DOS manual pronounces it as "doss." Who's right?

Early in the book you're told to turn on your Apple, without any mention that you need a disk in Drive 1; after you do so and "verify" that it's working, you move to the following page, where "booting a disk" is explained. Data statements are covered; how to restore the data is not. There are brief paragraphs on 80-column cards and extra memory, and CP/M is mentioned without even an explanation of what the C, P and M mean. Finally, a few commands (Trace, Notrace, Speed, FRE) are listed in the glossary, but aren't in the index or in the text.

Sanders suggests that you use the LEFT$ function to control the data length for random access files, to be sure you don't try to save more information than you designed the file for. While this approach handles the problem, it doesn't do a thing to tell the operator that his data was too long and so was truncated. It perhaps isn't the best approach, and even Sanders calls it "a bit brutal."

Finally, Sanders mentions some preferences for word processing and data handling and graphics packages (and others), but the listings are limited.

These flaws are minor and don't detract in any significant degree from the overall quality and depth of the book. In fact, the copy I examined came with a two-page "bug killer" that lists corrections for a few of the programs in the book. How many book publishers do you know of who'll admit they made a mistake? Compliments to Datamost.

Greg Glau
Prescott, AZ

Apple II Assembly Language

Marvin L. De Jong
Howard W. Sams & Co., 1982
4300 W. 62nd St.
PO Box 7092
Indianapolis, IN 46206
Softcover, 336 pp., $15.95

The Blacksburg Continuing Education Series, published by Howard W. Sams & Co., is, quite simply, the best way to learn to use microprocessors. And *Apple II Assembly Language* is a worthy addition to that series. Essentially, it's an Apple II rewrite of author Marvin De Jong's *Programming and Interfacing the 6502*, which was oriented toward the AIM-SYM-KIM single-board computers.

De Jong's two books, in fact, may be the best way to learn 6502 assembly language on a do-it-yourself basis. They also would make excellent textbooks for a hands-on course.

Apple II Assembly Language begins with a brief description of the Apple II computer; a presentation on the 6502 microprocessor's architecture follows. Read and Write operations and I/O also are covered. The first chapter concludes with information on the Apple II monitor and some exercises that utilize its routines.

Most of the book's nine additional chapters have a common organization—a clear statement of objectives preceding each chapter's main body of text and a group of exercises that both test and reinforce the reader's comprehension of the material covered.

In the second chapter, the reader is introduced to the writing and executing of simple assembly language programs. Branches and loops and logical (AND, OR, EOR), shift (LSR, ASL), and rotate (ROL, ROR) instructions are covered in the third and fourth chapters. The fifth covers arithmetic instructions (ADC, SBC, CMP), the sixth covers indexed addressing, and the seventh covers subroutines, interrupts and the processor stack (page 1 in memory).

De Jong goes on to discuss use of the 6522 VIA with the Apple, transmission of Morse code, analog-to-digital conversion and digital-to-analog conversion.

There is nothing significantly wrong with this book. A number of purely technical questions could be raised, and you'll find an occasional awkward sentence and a minor inconsistency here and there. They do little, however, to reduce the book's fundamental excellence.

I would recommend *Apple II Assembly Language* as a reference book for beginners in assembly language and to those more advanced. De Jong again proves his ability to present fundamentals in understandable terms, and then goes on to show real-world, practical applications.

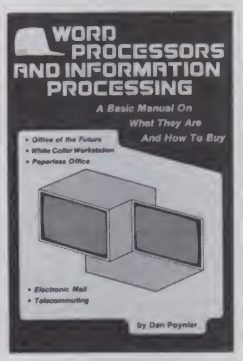
F. Kuechmann
Chicago, IL

Word Processors And Information Processing

Dan Poynter
Para Publishing, 1982
PO Box 4232
Santa Barbara, CA 93103
Softcover, 170 pp., $11.95

Word Processors and Information Processing is a unique book, written by a unique author, Dan Poynter. The introduction describes Poynter's entry into the word processing field by way of a self-published book on parachutes. . . . I guess you could say that he sort of dropped into the subject.

He did it well, too. I couldn't recommend a better introductory book on text processing and on what hardware, telecommunications and financial considerations should go into any buying decisions.



Poynter starts the book by showing the practicality of word processing. He includes data that would help decision-makers (and bean counters) determine how much return could be expected from a particular word processing investment. He consistently exposes the good and bad points and the various trade-offs—all based on practical experience.

Two of the nice features in the book are the background information and the graphic aids.

In chapter 3, for instance, Poynter outlines the parts of a word processor, including a time line showing its development starting in 1801. He provides plenty of diagrams and pictures presented in conjunction with the text; they're not used as "filler."

Poynter also describes word processor functions and features, as well as retail prices and operating costs. In the appendix, he offers 11 pages worth of places to write for more (or more current) information on word processing, including references to seminars, associations and magazines (yes, *Microcomputing* is there, but under its old name, *Kilobaud*). An excellent word processing glossary and index complete the book.

Poynter's word processing experience comes through in his writing. I've had many of the same experiences with the same equipment, and I've come up with many parallel conclusions. For example, when describing daisy wheel typing elements such as those used on Diablo printers, Poynter points out that they're subject to failure. In practice, they *do* break, but I don't think you'll find this mentioned in manufacturer's literature.

The book's strength is that it covers word processing frankly—and without prejudice. The author consistently offers caveats to help the reader reason out questions he might ask or to help form conclusions appropriate for his particular situation.

At the same time, Poynter doesn't shy away from technical matters. For example, he shows in diagrams how parts of a system interconnect and how raster scan characters are formed. Poynter also explains how the cost of moving text electronically may or may not make economic sense.

It's almost like having a private tutor holding your hand.

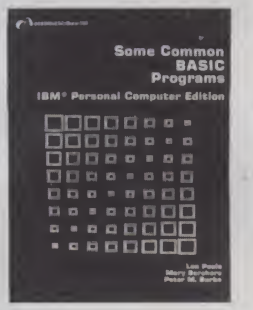
Jim Hansen
New Boston, NH

Some Common Basic Programs: IBM Personal Computer Edition

Lon Poole, Mary Borchers and Peter Burke
Osborne/McGraw-Hill, 1982
630 Bancroft Way
Berkeley, CA 94710
Paperback, 212 pp., $14.99

The introduction to *Some Common Basic Programs: IBM PC Edition* reads as follows: "This book is a collection of 76 practical programs, written in Basic for the IBM Personal Computer." Unfortunately, the only documentable statements in this topic sentence are that the programs are indeed written in Basic, and that there are 76 of them. Whether they are practical and just how tailored they are to the IBM PC is a matter of the user's needs and toleration.

The programs in this book can be subdivided into four applications categories: financial, mathematical, statistical and utility. Depending on the user's needs, they're either quite practical or useless.



Twenty-three programs are included in the financial category. They range from those for future value of an investment, depreciation and salvage value calculations, and interest rate conversion to loan and mortgage calculation programs. Also included is a check-writing program and programs for computing federal withholding taxes and for tax depreciation

schedules.

The 28 mathematical programs (depending on how you count things like simultaneous equations) include ones for integration and differentiation, interpolations, angle conversion, vector analysis and matrix manipulation.

The 19 statistical programs include routines for computing the area under several common distributions. The six utility routines are for computation of days of the week, given a date, days between dates, conversion to and from metric scales and alphabetizing of a list of names.

The question, of course, is: what's useful? If you're a mathematician, statistician or other professional in need of quick computations on trig polynomials, the bulk of the programs indeed will be practical. For the average user, however, the worth will have to come from the finance and utility routines, or from the examples of coding given in each program.

At least, however, Osborne/McGraw-Hill took the trouble to box all of the input and output routines in each program, so that you could change the Print statements to LPrints if you prefer printer output. Each program is presented with an example problem and a sample program run so that you can check the accuracy of your coding. And although you'd never know it unless you read the introduction carefully, the programs in this book are available on disk, but no price is specified and the vendor is not Osborne/McGraw-Hill.

Let's examine the coding itself in the programs. Essentially, the "customization" to the IBM machine that has been done includes getting the programs to run on that machine, a few inverse video routines (e.g., Color 0,7,0) for title displays, and the like. No use is made of the PC's function keys, no error-checking is done in the routines and no use is made of the PC's graphics capabilities, even in the three programs that employ graphics displays.

Some of this lack of effort can be ascribed to the authors' desire to make the book usable by the lowest common-denominated PC user without advanced Basic, a disk printer or color display. However, ignoring the function keys (except for Key Off statements) and not customizing the input routines with the error-checking devices available in PC Basic is taking the easy way out.

One suspects that the authors were in a hurry to get out their PC edition without wasting effort they had spent writing other editions. It shows.

Thomas V. Bonoma
Concord, MA

One suspects that the authors were in a hurry to get out their PC edition without wasting effort they had spent writing other editions.

How to Buy a Personal Computer (Without Anxiety)

Jonathan D. Lieff
Ballinger Publishing Co., 1982
54 Church St.
Cambridge, MA 02138
Softcover, 113 pp. $9.95
Clothbound, $16.95

The author of *How to Buy a Personal Computer (Without Anxiety)* is an M.D. and a psychiatrist, and somewhat of an expert on anxiety. But the further I read into this book, the more anxious I became.

Author Jonathan Lieff wrote this book because he couldn't find one like it when he began his own search for a personal computer. He recognized that all of those potential computer buyers out there who are not computer experts face the same anxiety-producing conflicts he faced: indecipherable documentation and buzzword-spouting, fast-talking computer salespeople.

Lieff wanted to acquire enough background information on personal computers so that he could tilt with salespeople on their own level. He couldn't find a suitable source for that information in a single volume. So after spending time learning about computers, he decided to write the very book he sought.

How to Buy a Personal Computer (Without Anxiety) is intended to help the average person overcome his fears of computers and learn enough about them to permit the wise choice of a machine that will help him most. Keeping this in mind as I started reading the book, I found my own anxiety increasing rapidly as I proceeded through chapters 4 and 5. I have never seen so much technical misinformation gathered together in so few pages!

Chapters 4 and 5 attempt to help the reader in "Understanding the Monster" and in learning the "Tools of the Trade." The author's own understanding of the innards of computers, both hardware and software, is woefully inadequate; he shows that he has acquired a goldmine of misinformation about what "chips" are, how they are fabricated, how big they are and how much information they can store. While his intentions certainly were honorable, I can't accept his advice that a computer based on the Intel 8008 (yes, 8008!) is acceptable, or would have a lot of software available for it.

Suppose the author had left these chapters out of the book, or had collaborated with a technical expert. How would the rest of the book have lived up to its intended purpose? Not too badly.

My anxiety diminished when I realized that the average layman for whom the book is intended probably would skip those chapters anyway (or wouldn't retain much of the erroneous detail) and would get on to the chapters "Brand Analysis," "Determining Your Own Needs" and "How to Buy a Computer."

These topics are what the potential reader is looking for anyway, and the writing of this part of the book is knowledgeable, insightful and accurate where it doesn't get too involved with technical details.

Ken Barbier
Borrego Springs, CA

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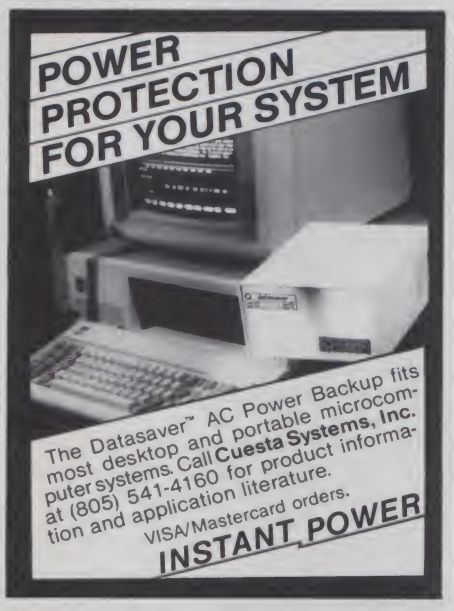

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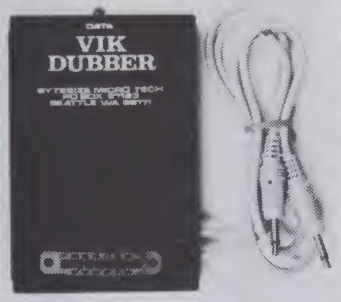

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CALENDAR

LOGON '83—Montana

LOGON '83, a five-day conference on "Technology, Mythology and Literacy in the New Age" will be held at Montana State University in Bozeman, MT, on August 1–5. The conference will examine the implications of computer technology on human culture and will bring together outstanding people from many fields of work: scientific and technical, educational and artistic, as well as from the media, industry and business.

For more information, contact Michael Sexson, English Department, Montana State University, Bozeman, MT 59717; 406-994-3768.

Microcomputers in Vocational Education—Wisconsin

A conference coordinated by the Vocational Studies Center, University of Wisconsin–Madison, will take place August 10–12 at the Concourse Hotel in Madison. Designed for people concerned with microcomputers and high technology in vocational education, the conference will feature classes, presentations of programs and exhibits.

For more information, contact Judy Rodenstein or Roger Lambert, 964 Educational Sciences Building, 1025 West Johnson St., Madison, WI 53706; 608-263-4367 or 608-263-2704.

IBM PC Faire—San Francisco

Computer Faire announces its first IBM PC Faire, to take place August 26–28 in San Francisco's Civic Auditorium and Brooks Hall. The Faire will focus on hardware, software and applications for the IBM Personal Computer, and will feature a large technical conference, a product exposition and a number of user group meetings.

For more information, contact Jim Warren at 415-851-7077, or write IBM PC Faire, 345 Swett Road, Woodside, CA 94062.

Australian Computer Conference

The tenth Australian Computer Conference is scheduled for September 12–15 in Melbourne, Victoria. The conference will deal in depth with virtually every area of computer application and management.

For details, write Professor A.Y. Montgomery, 10 ACC, PO Box 4063, Mail Exchange Melbourne, Victoria, 3001 Australia; telephone (03) 41 6220.

Mini/Micro-Midwest—Illinois

The Midwest edition of Mini/Micro will take place September 13–15 in connection with Midcon/83 at the O'Hare Exposition Center in Rosemont, IL.

For further information, call Jerry Fossler, 213-772-2965.

ICC—Newton, Massachusetts

The 1983/84 series of the Invitational Computer Conference (ICC) begins on September 13 at the Marriott Hotel in Newton, MA. The ICCs are one-day regional conferences directed to a select audience of volume buyers. The conferences feature displays of operating equipment, and technical seminars are held.

Attendance is by invitation. If interested, write or call Susan Fitzgerald, the Conference Manager, at B.J. Johnson & Associates, 3151 Airway Ave., #C-2, Costa Mesa, CA 92626; 714-957-0171.

Peripherals '83—San Francisco

The exhibition Peripherals '83 has been re-scheduled from Boston to San Francisco, and will be held September 13–15 in the Moscone Center.

Information can be obtained from Cahners Exposition Group, Cahners Plaza, 1350 E. Touhy Ave., PO Box 5060, Des Plaines, IL 60018; 312-299-9311.

Federal Computer Conference—DC

The sixth annual Federal Computer Conference will take place September 13–15 in the Washington Convention Center, Washington, DC. In addition to the program of presentations and workshops, there will be a large exposition of ADP equipment, systems and services on the second and third days.

For more information, contact Federal Education Programs, PO Box 368, Wayland, MA 01778; 800-225-5926 from outside Massachusetts; 617-358-5181 from within Massachusetts.

Euromicro 83—Madrid

Euromicro 83, the ninth annual symposium on microprocessing and microprogramming, will take place in Madrid on September 14–16. The purpose is to bring together people from business, industry, government and academia who are interested in the problems and applications of microcomputer systems.

For further details, write Euromicro, T.H. Twente, PO Box 217, 7500 AE Enschede, The Netherlands.

Computer Expo—Indiana

The second annual Indiana Computer Expo will be held at the Indianapolis Convention Center, Indianapolis, Indiana, on September 15th and 16th. The Exposition is particularly designed for business end users of micros and minis, and will deal with software and peripherals as well as basic computer systems.

For more information, call Ernie Kerns & Associates, 317-259-8111.

Deep in the Heart of Texas

The first Heart of Texas Computer Show is scheduled for September 16–18 at the Convention Center in San Antonio. The emphasis of the Show will be on microcomputer-based small business systems.

For further information, contact Robin G. Mann at 512-226-4636, or write Heart of Texas, PO Box 12094, San Antonio, TX 78212.

Compufair in Seattle

Over 20,000 people are expected to attend Compufair Seattle, to be held September 16–18 at the Seattle Center Exhibition Hall. Compufair will be the most comprehensive personal computer show and seminar series the Pacific Northwest has ever seen.

Participation at the presentations and seminars is included in the $5 per day admissions charge. For more details, contact Tom Ikeda, Compufair, Inc., 909 N.E. 43rd St., Suite 302, PO Box 45218, Seattle, WA 98105; 206-633-3247.

REPCON '83—New York

REPCON '83, the Fall Electronics Fair, will be held September 21–23 at the Terrace on the Park, Flushing Meadow, Queens, NY. Open to the trade only, the exhibition will include personal computers, components and materials, as well as electronic games and home entertainment products.

For more information, call A.D. Adams Advertising, 212-685-9060.

SICOB—Paris in the Fall

SICOB, the leading French computer exhibition, is scheduled for Sept. 21–30 in the exhibition halls at CNIT, la Defense, Paris. Just preceding this event (Sept. 19–23), the 9th World Computer Congress, IFIP Congress '83, will be held at the Palais de Congres. The Congress is the annual conference of the International Federation for Information Processing (IFIP), with membership in 42 countries.

For full information on these events, contact Philip H. Dorn, Dorn Computer Consultants, Inc., 25 East 86th St., New York, NY 10028; 212-427-7460.

Maecon/83 in Kansas City

The Maecon/83 High-Technology Electronics Exhibition and Convention is scheduled for September 26–28 in Bartle Hall, Kansas City, MO.

For more details, call Jerry Fossler, 213-772-2965.

ICC—Minneapolis

The second Invitational Computer Conference of the fall will take place on September 29 at Radisson South Hotel, Minneapolis, MN. (See ICC item above for more details.)

CP/M '83/East—Boston

CP/M '83/East, the International Conference and Exposition of CP/M microcomputer software, will be held September 29–October 1 at Hynes Auditorium in Boston, MA.

For further information, call 800-343-2222 or 617-739-2000.

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Apple, VIC-20, CP/M software, hardware, interface design. Apple II disk Doublebyter, VIC-20 Video Text System. Custom spreadsheet overlays, user-friendly applications are our specialty. **Computer Technology Consulting, Box 1593, Antioch, CA 94509. 757-8342.**

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Woodbridge, CT

RIP-SOFT! New game spoofs computer bizz. Break the 'calc habit—IBM PC software—See how—Open Basic—Program catalog—Programmer's toolbox—Utilities and fun. **People Systems, Ltd., 78 Maplevale Drive, Woodbridge, CT 06525; 393-3913.**

Farmington, MI

Specialists in useful software for PET, Commodore 64, and Apple. Grading program, sports packages, test maker, word processor, database, library packages, etc. Write for details. **Midwest Software, Box 214, Farmington, MI 48024. 477-0897.**

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We are the leading area computer store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. **Computer Centre, 909 S. Tamiami Trail, PO Box 130, Nokomis, FL 33555. 484-1028.**

Milford, NH

SAGE 68000 microcomputer authorized dealer. Service, custom programming, consultation, terminals, printers, etc. Write for special low, low prices. You'll be glad you did! **New Castle Electronics, 100 Christian Hill Road, #3, Milford, NH 03055. 673-2806 or 673-9667.**

Dealers: Listings are $15 per month in prepaid quarterly payments, or one yearly payment of $150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.

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Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to **Classifieds, Microcomputing, Peterborough, NH 03458**. Do not include any other material with your ad as it may be delayed.

Used Heath H-8, S-100 BUS, and Wang Laboratories computer for sale. Memory board, I/O card, terminal, disk drive, software and complete system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Croton Falls, NY 10519.

Timex/Sinclair users: Write for information concerning the Z-WEST (SDTSUG) newsletter publication. SASE or stamp appreciated. SDTSUG/Z-WEST, PO Box 2411, Vista, CA 92083.

TRS-80, 48K, Mod I; MDX-2 interface, RS-232, modem, printer port; two tandon 40-track drives; NEWDOS; Fortran; and more! $1595 good cond. For more info, call Wendell 303-733-2439, 8-5.

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Kilobaud Microcomputing: Complete set, #1 to # 78 (June '83). $150; I ship. Rick Racine, 2520 S.E. Alexander, Topeka, KS 66605; 913-234-2707.

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NEW SOFTWARE

Edited by Dan Muse

A Complete Business Package

GraphPlan, from Chang Laboratories (5300 Stevens Creek Blvd., Suite 200, San Jose, CA 95129) is a business spreadsheet package offering built-in statistical commands, presentation-quality graphics and sorting and ranking capabilities.

The spreadsheet has built-in formulas and requires 70 percent fewer keystrokes than a calc spreadsheet. For example, to add two rows with GraphPlan requires five keystrokes. Twenty are required with a calc spreadsheet.

GraphPlan's advanced graphics features include automatic generation of legends, numerical, date, time and logarithmic X and Y axis labels and tic marks. Presentation-quality graphics can be created individually or they can be combined.

GraphPlan runs on CP/M systems and the IBM Personal Computer under MS DOS. Supported printers include Epson, IDS, Microline, C. Itoh and the HP 7470A two-pen plotter. A minimum of 64K to 128K, depending on system, is required. At least one double-sided disk with 330K of storage capacity is required.

GraphPlan costs $395. Reader Service number 468.

Accounting on Apple

Sup'r Ledger is an accounting package that lets Apple II and IIe computers handle up to 200 separate accounts, 1400 transactions per time period and ten independent cost centers.

Sup'r Ledger generates seven reports: Working Trial Balances; Balance Sheet; Income Statements (with percentage of any user-defined revenue base); General Ledger; Journals; Charts of Accounts (a flexible structure allowing you to design custom reports); and Budget Income Statement.

Sup'r Ledger is menu-driven for easy input of data and high clerical efficiency, offers rapid closing of the current period and permits chained reports in any sequence. The program also maintains full transaction details and provides extensive error checking with descriptive error messages.

Sup'r Ledger, an 80-column program, costs $300 and is manufactured by M & R Enterprises, 910 George St., Santa Clara, CA 95050. Reader Service number 472.

64 Software

Computer Marketing Services, Inc. (300 W. Marlton Pike, Cherry Hill, NJ 08002), has announced four new software packages for the Commodore-64: Diary 64, Checkbook Manager, 64 Mailing List and Vanilla Pilot.

Diary 64 is designed to keep track of telephone numbers, birthdays, doctor appointments, business meetings—just about anything you need to remember. Diary works like a notebook with its pages appearing on the screen. You can file information by numbers or by dates. Information is stored on disk or cassette. Diary costs $59.95.

Checkbook Manager is designed to be simple enough for the home user, yet sophisticated enough for business use. Each file has a capacity of 250 checks, 100 deposits and 50 account charges. A password feature is built-in to prevent unauthorized users from obtaining information. The disk version of Checkbook Manager costs $39.95. The cassette version costs $34.95.

The 64 Mailing List program can hold 250 names and addresses per file and features full-screen editing for adding, deleting or changing addresses. It has full sort capabilities and can print or review individual entries, a sorted version of the file or the entire file. Disk version is $34.95; cassette version is $29.95.

Vanilla Pilot is designed to be so easy to use that even schoolchildren can write programs. Commands are simple—for example, T for type, J for jump, G for graphics and D for draw. Turtle Graphics adds a powerful set of commands that make it easy to change directions and draw lines of any length. The turtle has a palette of 16 colors. When you are ready to add sound to your program, Vanilla Pilot has a B (for beep) command with a list of various sound parameters. Vanilla Pilot costs $29.95 on either cassette or disk. Reader Service number 470.

Sixteen Statistical Timex-Sinclair Programs

SIFT (Statistical Interactive system For the Timex-Sinclair 1000) consists of 16 2K statistical routines, such as linear and multiple regressions with transformations; one-way, two-way and Latin square analysis of variance; and T-tests.

The programs, which also run on the Sinclair ZX-81, are designed to be flexible enough for students, teachers, businessmen and engineers to use. For the businessman, trends can be estimated with confidence intervals on all the statistics. For the engineer, differences in quantity and quality of production can be estimated. And, for the student, complicated statistical procedures become simpler.

The user's manual has three tables of contents, an index and listings of all the programs. The manual is designed to be used as both an instructional text and a reference.

SIFT costs $25 and is manufactured by CompuCraft, PO Box 149, Hinsdale, NH 03451. Reader Service number 473.

Calculating Statistics

The Statistician's Mace is designed to turn your IBM Personal Computer into a number cruncher. It calculates statistics frequently used by scientists, business researchers, engineers, statisticians and others who need to analyze data obtained from surveys and experiments.

Statistician's Mace accepts data from the PC's keyboard, the disk files created by Statistician's Mace or from disk files prepared by your text editor.

With the Statistician's Mace, first-time users can immediately begin analyzing sets of data containing just a few, or a thousand, elements, without having to understand complex commands.

In addition to its other features, Statistician's Mace is capable of performing the Hodges-Lehman aligned ranks test. The program requires 128K and costs $145. The documentation can be purchased separately for $25.

Mace, Inc., 2313 Center

Ave., Madison WI 53704. Reader Service number 474.

A Computer In the Sandbox?

Midwest Software (Box 214, Farmington, MI 48024) has announced the Kinder Koncepts series of programs. The programs aimed at kindergarten-age children focus on reading readiness, basic math concepts, perception, pattern recognition, letters, numbers, colors and shapes.

The Kinder Koncepts will be available on cassette ($7.95 each) for any Commodore system but the VIC-20. It will also be available for the same computers and the Apple II Plus for $69.50 for ten programs.

The disk version of Kinder Koncepts will be menu-driven and all will be similar in design. Ten problems are presented to the child. If the correct response is given on the first try, the child is rewarded with a smiling face and a tune is played. An incorrect answer is followed with a frowning face. Each program has a built-in graph, so the teacher or parent can monitor progress. All programs operate with a single keystroke and reading is kept to a minimum. Reader Service number 475.

Two Handy TS-1000 Programs

Timeworks, Inc. (405 Lake Cook Road, Building A, Deerfield, IL 60015), has released two programs for the Timex-Sinclair 1000 and ZX-81 computers: The Programming Kit I and the 5-2K Family Pak.

The Programming Kit I is a how-to learning approach to Basic programming and includes Timeworks' eight-step approach to Basic Programming, which is fully explained in the program.

The 5-2K Family Pak is a series of five household programs for the basic 2K TS-1000 and ZX-81. The programs are designed to improve the day-to-day productivity of you and your family. The program includes Memoboard (a family message center), Checkbook Balancer, Recipe Recorder, Mini-Money Manager and Homework Helper.

The Programming Kit I costs $16.95 and the 5-2K Pak costs $14.95. Reader Service number 467.

Computer Coaching

The BEST Computer Coach is designed to help novice computer users overcome the fear of the unknown. The Coach offers simple, clear definition of basic computer terms and concepts.

The Coach features two programs that combine the learning advantages of computer graphics and an audio tape that reinforces the video in two 7½-minute segments. The programs describe the various elements that make up the system and explain how those elements work together to create the desired effect.

The BEST Computer Coach is available for the Commodore-64, VIC-20, Atari 400/800, Texas Instruments 99/4A and Apple IIe. It is manufactured by Boston Electronic Systems Training (BEST), 24 Munroe St., Newtonville, MA 02160. Reader Service number 466.

The Disk Manager

Diskette Manager is a library program for disk management. The program, for the IBM Personal Computer, features a label-printing capability that prints the disk name, filenames, up to eight lines of comments and the storage status of each disk.

Diskette Manager utilizes the graphics capabilities of the IBM PC and Epson dot-matrix printers and prints up to 64 filenames on one standard 4 × 1 7/16 inch label. If more than 64 files reside on a disk, or if the number of comments exceeds the space available, a second label is printed.

A catalog file containing disk names, filenames, file sizes, creation date/time and comments, is updated as disks are labeled. Reports can

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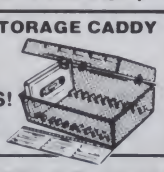

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reproduce all statistical information regarding each disk. One catalog disk can contain 6000 file or comment entries regarding 200 disks.

Catalog functions operate through the use of a relational database. Programs and catalog files reside on one disk, leaving the second drive free for disk management.

Diskette Manager requires an IBM PC, 64K, 80-character display, two disk drives and a dot matrix printer—either IBM or Epson with Graftrax Plus. Diskette Manager costs $50 and is manufactured by Lassen Software, Inc., PO Box 1190, Chico, CA 95927. Reader Service number 461.

Keeping Track of CP/M Disks

Catalog, from SRX Systems (2812 Westberry Drive, San Jose, CA 95132), builds and maintains a compressed database containing information relevant to each file on CP/M disks.

Catalog is designed for anyone who uses multiple disks and disk files. The program keeps track of disks and disk files by making use of a numerical code permanently assigned by the user. The code lets Catalog identify files as residing on a specific disk in the library. It also provides a way for you to further identify any disk by entering disk titles. You can describe the disk and files for recall and file maintenance at a later time.

Each disk to be cataloged is assigned a number between 1 and 255. The disk's ID can be typed in by the operator, or made automatically by a directory entry on the disk. In either case, Catalog reads the disk directory and creates a database entry for each file named in the directory. Once a database is created, you can add disk descriptions and file identification. The program accepts identification notes that range from print specifications on a text file to scores on a game program.

Catalog runs under CP/M and requires a Z-80/8080 system with a minimum of 24K RAM and two disk drives. It costs $75. Reader Service number 471.

CP/M Made Easier

Menu/Power is designed to take the complicated commands needed to run CP/M and turn them into friendly, plain English commands.

Menu/Power helps eliminate typing errors caused by complicated filenames, because it numbers all the disks' files. You select the file number and CP/M is fed the filenames.

Menu/Power can rescue glitched files and recover major portions of destroyed data or text files automatically.

Erase, space, test, recover, copy, sort, rename, run, compare, type, size, protect and unprotect are some of the more than 20 Menu/Power commands.

Password, a command to protect sensitive data files, and code, to change that password, are other commands that do not appear on the menu screen.

Menu/Power requires no installation or configuration. You just load the disk into any CP/M machine and it will make all the fundamental CP/M operations more understandable. There is also an IBM Personal Computer version of Menu/Power available.

Menu/Power costs $149 and is available from Computing!, 2519 Greenwich, San Francisco, CA 94123. Reader Service number 477.

Call It a Loan

Simple Soft, Inc's (480 Eagle Drive, Suite 101, Elk Grove, IL 60007) QuickCalc Loan Analyzer is designed to quickly and thoroughly analyze a mortgage or loan.

Quick Loan Analyzer features several professionally formatted reports. Calculations are included to show complete amortization schedules, effective interest rates, interest paid between dates, the impact of loan charges and the effects of an early loan termination. The program calculates the unknown variables such as loan amount, loan term, loan payment and balloon payments.

The Loan Analyzer comes with a comprehensive reference guide. The manual includes complete operating instructions and guidelines for evaluating the results.

The Loan Analyzer costs $99. Reader Service number 464.

Stretching VisiCalc's Capability

Multisoft Corporation's (14025 SW Farmington Road, Beaverton, OR 97005) StretchCalc lets users of VisiCalc extend the capability of that product.

With StretchCalc, you can generate eight types of graphs and charts in response to what if. . .? questions. StretchCalc lets you manipulate the columns and rows of your spreadsheet with sort and rearrange commands. Command sequences that are used frequently can be stored away and invoked with a single keystroke.

StretchCalc is an integrated extension to the VisiCalc program. You can invoke any VisiCalc or StretchCalc command.

StretchCalc costs $99 and includes the software, a preprogrammed set of keysaver commands and a set of demonstration spreadsheets on a 5¼-inch disk. A version of StretchCalc without graphics is available for $49. Reader Service number 469.

Keeping Writers Organized

The Research Assistant is a word processing enhancement package for academic or professional writers. The Research Assistant is designed to organize your notes, construct bibliographies, and footnote your manuscripts. It includes Bibliographies, Notebook and Footnote programs.

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Notebook is a database management system designed for storing and retrieving text. It can be used for research notes, lab journals, bibliographies and abstracts of articles. You can store almost any amount of textual information in any format and can search or sort on any text in any field.

Footnote automatically numbers and formats footnotes in WordStar or Select files. The footnotes can be typed anywhere in the manuscript or in a separate file, and Footnote places them at the bottom of the correct page or in an endnote file.

The complete package costs $349. Available from Digital Marketing, 2363 Boulevard Circle, Walnut Creek, CA 94595. Reader Service number 460.

Commodore Spreadsheet

Practicalc is an electronic spreadsheet program for the Commodore-64 and VIC-20. Practicalc is designed to perform the functions of more expensive spreadsheet programs.

Practicalc allows you to enter titles and numerical data into rows and columns that are displayed on screen; it then performs a number of mathematical functions and projections.

Once the different formulas are entered for different row and/or column locations, other row and column values can be determined from the previously entered values.

Practicalc is capable of over 20 mathematical operations, including all Basic functions and row and column operations (such as sum, count, max, min and avg). These operations may also be combined (e.g., square + sum). Practicalc also allows numeric formulas such as floating decimal, integer or two decimal places. All numeric entries are carried to nine digits, whether they are displayed or not.

Computer Software Associates, Inc., manufactures Practicalc. The software is distributed by MicroSoftware International, Inc., 50 Teed Drive, Randolph, MA 02368. The VIC-20 version costs $39.95, and the Commodore-64 version sells for $49.95. Reader Service number 476.

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NEW PRODUCTS

Edited by Dan Muse

A 16K Computer For $79.95

The Timex-Sinclair 1500 is a 16K, fully-programmable computer that features black-and-white graphics capability, expandable memory, a movable-key typewriter-format keyboard and use of either standard audio cassette or solid state minicartridge software. It costs $79.95.

The TS-1500's 16K RAM can be expandable to 32K with the addition of TS-1016 Memory Expansion Module. The TS-1500's graphics display area can be controlled by plot or unplot graphics commands, in addition to the 22 predefined graphics characters.

The TS-1500's multifunction keyboard has 40 full-movement, typewriter-format keys with 22 graphics characters and 22 special characters. The keyboard also features Timex's key-word entry, which enables each key to perform as many as six possible functions. The TS-1500's programming language is extended Basic.

The computer is compatible with all of the peripherals and software available for the TS-1000, including the TS-1016 Memory Expansion Module and the TS-2040 thermal printer.

Timex Computer Corp., PO Box 2655, Waterbury, CT 06725. Reader Service number 489.

Just Imagine It . . .

The Imaginator is designed to turn any Heath/Zenith-19 or -89 into a powerful graphics display unit, without sacrificing any of the standard features of the Heath/Zenith units.

The Imaginator consists of a single printed-circuit board with its own on-board microcomputer and built-in graphics instructions set. The graphics can be accessed directly from any high-level language running in the host—PL/1, Fortran, Pascal, Basic and others.

The Imaginator can be purchased for $215 for a bare board and graphics firmware, while the completely assembled and thoroughly tested unit is available for $445.

The Imaginator is manufactured by Cleveland Codonics, Inc., PO Box 45259, Cleveland, OH 44145. Reader Service number 492.

TeleVideo Enters Portable Market

The TeleTote I is TeleVideo, Inc.'s (1170 Morse Ave., Sunnyvale, CA 94086), entry into the portable computer market.

TeleTote I features network capability; an optional RS-422 network port lets the TeleTote I be linked with a TeleVideo network for access to shared files, printers and electronic mail.

The computer weighs 25 pounds, has a nine-inch video display screen with 640 × 240 graphics resolution. The TeleTote's screen can display 24 lines of text with 80 characters per line. It is compatible with TeleVideo's 8-bit desktop professional computer, the TS803.

The TeleTote I has a Zilog Z-80A CPU with 64K RAM (expandable to 128K). It also features a 5¼-inch floppy disk drive, a SuperMouse port for quick cursor manipulation and two RS-232 printer/modem ports for hard copy and telephone connections.

The TeleTote I comes with the CP/M operating system, the GSX-80 graphics extension, word processing, spreadsheet and graphics software. The basic unit price is $1499. A second disk drive can be added for $449, or a two-drive system can be purchased initially for $1899. The network option costs $495. Reader Service number 488.

A Cheap Mouse

Microsoft Corporation (10700 Northup Way, Bellevue, WA 98004) has released a low-cost mouse for use with the IBM Personal Computer as well as any MS-DOS-based

The Timex-Sinclair 1500 is a 16K, fully-programmable computer with black-and-white graphics capability and typewriter-format keyboard for $79.95.

TeleVideo's TeleTote I is a 25-pound portable computer that features a nine-inch video display, CP/M operating system and one or two disk drives.

personal computer.

The Microsoft Mouse is priced at $195 and comes with three application programs that help you learn how to use the mouse.

The Microsoft Mouse is used to quickly move or reposition a cursor on the screen. When you move the mouse across a flat surface, the cursor will track across a screen. No special prepared surface is required. Two buttons are provided to select decision alternatives or commands from the screen.

Reader Service number 483.

Commodore Keypads And Printers

Home Computer Corporation (154 Heard Road, Kathleen, GA 31047) has announced a numeric keypad for the Commodore-64 and VIC-20 Computers.

The keypad comes in standard and hexadecimal versions. The keypad is designed to aid in the entry of numerical data in business and machine-language applications. It consists of a 24-key array, which is connected to the computer by a ribbon cable.

Installing the keypad does not require soldering. It costs $79.95. Reader Service number 491.

Cardco, Inc. (313 Mathewson Ave., Wichita, KS 67214), has designed two printers for the C-64 and VIC-20 computers.

The Cardprinter/LQ1 is a letter-quality, daisy-wheel printer that prints at 14 cps in either red or black. It offers bold, shadow or underline printing in normal or proportional modes of ten, 12 or 15 cpi. The printer costs $599.95. Options will include a tractor-feeder for $149.95, a cut-sheet feeder with a capacity of 200 sheets ($199.95) and a keyboard for direct printing ($199.95).

The Cardprinter/DM1 is a small dot matrix impact printer that will print 40 columns of text on standard three-inch adding machine roll paper. The printer features a print speed of 50 cps, full Commodore graphics, full hi-res dot addressable graphics and printing in red or black. It costs $149.95. Reader Service number 490.

Going Mad

The Mad-1 is a 16-bit system from Mad Computer Inc. (3350 Scott Blvd., Building 13, Santa Clara, CA 95051). The Mad-1 features Intel's 80186 microprocessor and futuristic modular housing. The system's modularity is designed to allow easy expansion, reduce heat buildup and enable boards to be repaired easily.

The Mad-1 is hardware and software compatible with the IBM Personal Computer. The Mad-1 comes with version 2.0 of the MS-DOS operating system. Concurrent CP/M-86 is optional. Mad will initially offer third-party software, such as Peachtree's accounting series and Microsoft's Multi-Plan until artificial intelligence proprietary software is available.

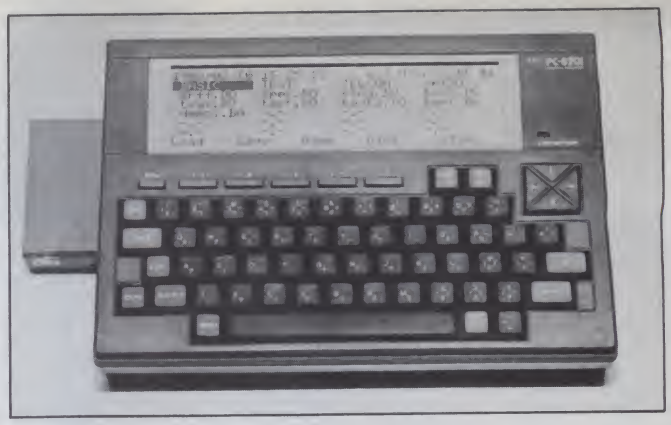
Four units comprise the Mad-1 system: the Data Module, the Computing Module, the keyboard and a display monitor, and the Expansion module, which provides an additional four slots.

The Data Module, like the Computing and Expansion Modules, measures 12½ × 15⅜ × 2⅜ inches. The Data Module houses the storage media and power supply.

The Computing Module houses the CPU, with 16K ROM, 256K RAM (expandable to 512K), and optional Intel 8087 coprocessor, a combination color and monochrome video controller and one expansion slot.

The Mad-1's keyboard is ½ inch high and consists of 85 keys, including ten special function keys and a numeric keypad. The Mad-1 costs $4000 to $6000, depending on the configuration. Reader Service number 484.

The Mad-1 Computer, from Mad Computer, Inc., is IBM PC-compatible and features Intel's 16-bit 80186 microprocessor.



The NEC PC-8201, from NEC Home Electronics (U.S.A.), Inc., features a 40-character by eight-line display, built-in text formatting and telecommunication software, five function keys and an 80C85 microprocessor.

NEC's Portable Computer

NEC Home Electronics (U.S.A.), Inc. (Personal Computer Division, 1401 Estes Ave., Elk Grove Village, IL 60007), has announced the release of the NEC PC 8201 Portable Computer.

The computer is 11.8 × 8.4 × 2.4 inches and weighs about four pounds. The PC-8201 uses the 80C85 microprocessor and comes with 16K RAM, which is expandable to 64K, and 32K ROM. The system features an LCD of 40 characters by eight lines (240 × 64 dots).

The 8201's keyboard has a total of 55 keys in Selectric-style layout and offers five programmable function keys. It also offers two special paste/insert and delete/backspace keys, which provide text-editing functions.

The NEC portable is equipped with Microsoft Basic, a telecommunications program and a text-editing program in ROM. The computer is powered by four AA alkaline batteries; an ac adapter is optional.

The PC-8201 also features an interface for a cassette tape recorder, a Centronics-type parallel printer port, an RS-232C serial port, and an interface for an optional bar-code reader.

The NEC PC-8201 costs about $700. Reader Service number 494.

Hail to the Queen

The PROMQueen is a microprocessor development system cartridge for the Commodore VIC-20 computer. The PROMQueen is designed to make writing machine-language programs less diffi-

The PROMQueen, from Gloucester Computer Company, Inc., is a microprocessor development cartridge that simplifies the development of machine-language programs on the VIC-20.

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cult, time consuming and laborious.

As a complete development system, the PROMQueen features powerful editing software, HexKit 1.0, to provide keyboard input and CRT display. Adding 8K of memory to the VIC-20 (4K ROM and 4K RAM), PROMQueen performs as a 4K ROM emulator, ensuring that programs written on it will work on the microprocessor chosen, as well as the VIC-20 itself.

The HexKit software and the VIC-20's special function keys combine for quick block transfer, remapping, transfer of bytes to and from marked locations, instant jumps to addresses specified in commands (with optional return to the address jumped from), global search for opcodes that are likely to need remapping when blocks are transferred, and other features.

After the program has been tested under process conditions, the PROMQueen will burn the program into erasable programmable ROM (EPROM) chips.

The PROMQueen features automatic control of EPROM burn and verification, with a 4K burntime of five minutes. The HexKit program makes any Basic program self-starting—automatically loading and running the program when the computer is turned on.

The PROMQueen costs $249 and is available from Gloucester Computer Company, Inc., 1 Blackburn Center, Gloucester, MA 01930. Reader Service number 485.

A Briefcase Portable

The SKS 2502 Nano, from SKS Computers, Inc. (4091 Leap Road, Hilliard, OH 43026), is an eight-bit computer housed in a leather briefcase.

The Nano features dual 5¼-inch, 400K disk drives, a Z-80A CPU, 80K RAM, a built-in CRT and separate keyboard controller. It also offers two RS-232C serial ports for printer and modem connections, and the CP/M operating system.

The Nano's display is 80 characters long by 16 or 24 lines, with reverse video/magnified character attributes. The software, in addition to the CP/M operating system, includes modified C Basic, Perfect Writer, Perfect Filer, Perfect Speller, Perfect Calc and Menu Runtime.

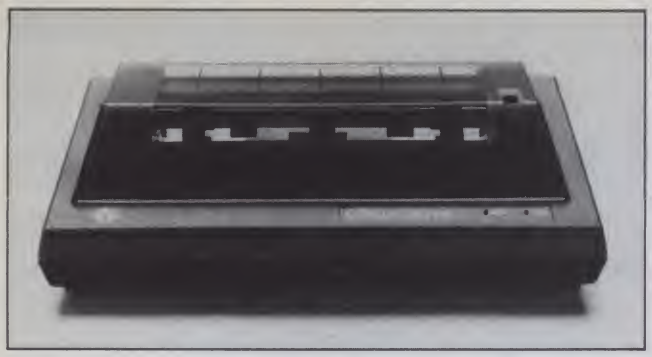
The Nano is priced at $2495. Reader Service number 486.

The Banana Printer

The Banana, from Leading Edge Products, Inc. (225 Turnpike St., Canton, MA 02021), is an 80-column, tractor-feed printer that is capable of printing alphanumerics or graphics on fan-fold forms from 4½ to ten inches wide. Print speed is 50 characters per second. It costs $249.95

The Banana's printhead is of unihammer design for greater simplicity and consistency. Characters are printed in a clear, 5×7 matrix. Nor-

The Nano, from SKS Computers, Inc., is an eight-bit, Z-80-based computer contained in a leather briefcase-type housing unit.



The Banana, from Leading Edge Products, is an 80-column, tractor-feed printer that costs $249.95

mal character spacing is the standard ten characters per inch, equivalent to pica type, with a maximum of 80 characters a line. Double-width characters (five per inch) can be substituted under software command.

The printer features character and dot-addressable graphics modes, with a density of 63×69 dots per inch. Line spacing in graphics mode is reduced to nine lines per inch, allowing graphics characters on adjacent lines to abut when desired.

A Centronics-type parallel interface allows direct hookup to most microcomputers, including Apple, IBM, TRS-80 and Kaypro. The Banana is 16×5×8 inches and weighs 12 pounds. Reader Service number 482.

Commodore Unveils Portable

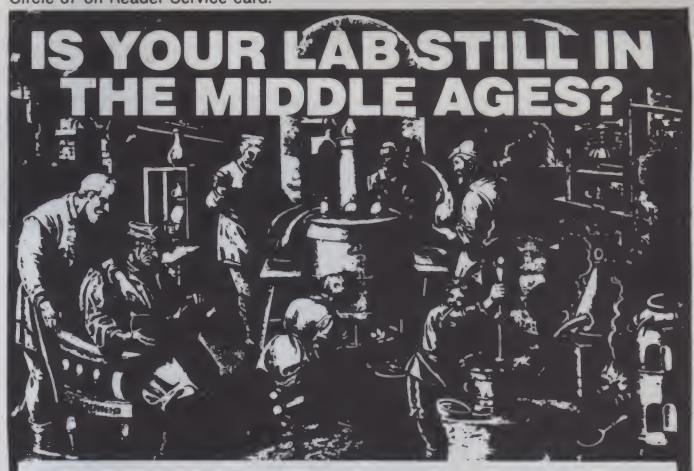
Commodore Business Machines, Inc. (Computer Systems Division, 1200 Wilson Drive, West Chester, PA 19380), has introduced a portable computer for the traveling businessman. The portable, called the Executive-64, features 64K RAM, a full upper/lowercase detachable keyboard, built-in six-inch color monitor and a built-in floppy disk drive with 170K capacity; a second drive is optional.

The Executive-64 weighs about 38 pounds and is 5× 14½ × 14½ inches. The portable is fully compatible with VIC-20 and Commodore-64 peripherals.

Using a Z-80 cartridge, the Executive-64 can accommo-

The Executive-64, from Commodore Business Machines, features 64K RAM, full upper- and lowercase, detachable keyboard, built-in six-inch monitor and a single floppy disk drive.

Circle 87 on Reader Service card.



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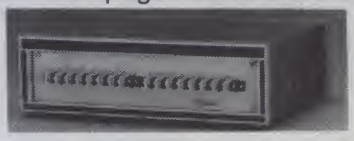

ALIS automation systems are available NOW in the following configurations:

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- **Analog Output: ALIS/AO** **$841**
  (2 channels, 0.39% Prec., 10 Volts Full Scale)
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(517) 337-9226

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date a CP/M operating system. With a PET emulator, it can use much of the available PET software.

The Executive-64 can use the large number of game cartridges available for the 64 family of computers and has full music and sound capabilities.

Resident in the Executive-64's ROM is Basic V2. Other high-level programming languages include Pascal, Logo, Assembler and Pilot. Also, the Executive-64's 6510 central processor is 6502-program compatible. The computer costs $995. Reader Service number 496.

CP/M Business Computer

Multitech Electronics, Inc. (195 W. El Camino Real, Sunnyvale, CA 94086), has recently introduced the MIC-500, a system aimed at the small-business user.

The MIC-500 combines a high-speed Z-80A processor with semiconductor memory and dual 5¼-inch floppy disk storage. The floppy drives provide 400K of storage.

The computer runs CP/M 3.0 and comes with Perfect Writer, Perfect Filer, Perfect Speller, Perfect Calc and Perfect Plan software. Application programming languages for the MIC-500 include C Basic, Cobol and Pascal.

The MIC-500 offers 64K RAM, two serial RS-232C ports for terminal and communications devices, and an eight-bit parallel port for Centronics-type printers. The MIC-500 costs $1395 without a terminal and $1995 with a terminal. Reader Service number 495.

A Powerful Portable

The Sharp PC-5000 is a complete 16-bit system in briefcase size. The computer weighs 12 pounds, and comes with all the features necessary to make it fully portable.

The PC-5000 comes with 128K RAM (expandable to 256K); two-slot expansion bus; an eight-line by 80-character liquid crystal display (LCD) with a graphics display capacity of 640 × 80 dots; and a thermal transfer, serial printer that operates with plain or thermal paper. The printer has a capacity of 80 characters (12 characters per inch) or 66 characters (10 characters per inch).

The PC-5000 also features an RS-232C interface and an audio cassette interface. The system is powered with a rechargeable battery (with an ac adapter).

For pricing information contact Sharp Electronics Corporation, 10 Sharp Plaza, Paramus, NJ 07652. Reader Service number 493.

Multitech Electronics' MIC-500 is a dual-floppy, Z-80A-based computer designed for the small-business user.

Taking Care of Business

The Fujitsu Micro 16s Personal Business Computer is designed to be used by small businesses, departments within larger companies or professionals such as lawyers, bankers, distributors, manufacturers and programmers.

The Micro 16s features two main processors, the 8-bit Z-80 and Fujitsu's 16-bit 8086. The Z-80 runs the CP/M 2.2 operating system.

The dual microprocessors are integrated under CP/M-86, word processing and electronic spreadsheet software, and can operate 8- and 16-bit CP/M-based applications programs to give you a complete system designed to meet most

The Sharp PC-5000 is a complete 16-bit system that features 128K RAM, 8 × 80 LCD and a serial printer.

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CP/M is a trademark of DIGITAL RESEARCH. LYNC is a trademark of MIDNIGHT SOFTWARE.

The Fujitsu Micro 16s Personal Business Computer features a dual-processor CPU, 128K of parity-checking RAM, detachable keyboard, CP/M-86 operating system, word processing and electronics spreadsheet software, 48K graphics RAM and RGB color monitor.

small business needs.

The Micro 16s has two 5¼-inch floppy disk drives with 320K of formatted storage each, and 128K of parity-checking RAM, expandable to one megabyte. It also has parallel and serial output ports and an advanced high-resolution color graphics capability.

The computer's keyboard is detachable and features 98 sculpted keys, tactile feedback, numeric keypad and ten programmable keys.

The system costs $3995. Fujitsu Microelectronics, Inc., Professional Microsystems Division, 3320 Scott Blvd., Santa Clara, CA 95051. Reader Service number 487.

Panasonic's Two Printers

Panasonic Industrial Co. (One Panasonic Way, Secaucus, NJ 07094) has released two dot matrix impact printers that feature high-speed printing and graph capabilities.

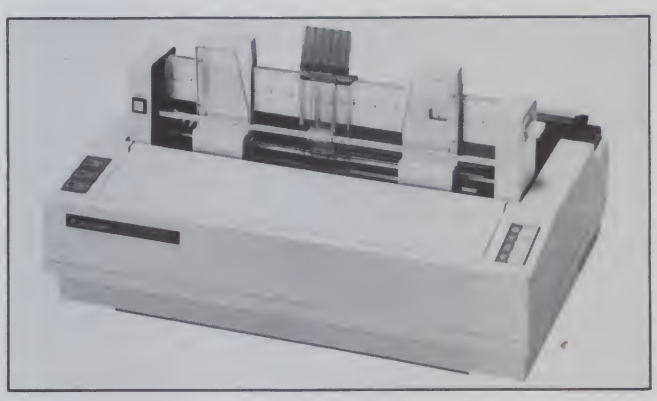
The Panasonic KX-P1160 is a bidirectional printer with a logic seeking head that is designed to print up to 165 characters per second in Pica, and 196 characters in Elite.

The KX-P1160's 9×3 dot matrix forms 96 ASCII characters with descenders. The unit has an adjustable sprocket pin feed that is capable of handling fanfold paper from four to 15 inches in width. An optional front inserter is available to print single sheets.

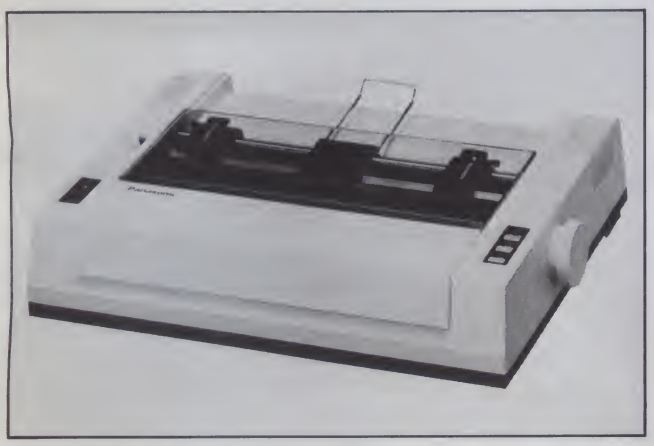
The KX-P1160 is equipped with a standard parallel interface and has an optional RS-232C interface and a microprocessor-controlled line spacing feature that allows selectable spacing, both forward and reverse. The KX-P1160 costs $1750.

Panasonic's KX-P1090 is a bidirectional printer with graph capabilities. It prints at 80 characters per second (Pica) and 96 characters per second (Elite), and can print up to 80 characters a line.

The KX-P1090 can accommodate fanfold and letter paper from four to ten inches in width or an 8¼-inch roll of paper. The printer comes with a standard parallel interface and can be used with an optional RS-232C interface. It costs $550. Reader Service number 480.



The KX-P1160, from Panasonic, is a bidirectional printer that prints 165 Pica and 196 Elite cps. It costs $1750.



Panasonic's KX-P1090 is a bidirectional printer that costs $550. The KX-P1090 prints 80 Pica and 96 Elite cps.

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REVIEWS

(From p. 146.)

If you own an Apple III and have not yet purchased a database program, I recommend that you consider this program. At $100, it offers exceptional value. *(Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 85014.)*

Justin Crom
Littleton, CO

Calc Result

You don't have to be A math wizard To use this spreadsheet

Flip open a copy of any computing magazine, and you'll find ads for financial analysis programs commonly referred to as spreadsheets. The more pages you flip, the more ads you'll see.

Then you might begin to notice the various third-party manuals and other publications being sold to help you learn how to use the spreadsheet software that you acquire.

I was beginning to wonder if I had the necessary time, ability and intelligence to fully use a spreadsheet program, when I was rescued by Calc Result, a new spreadsheet package from Handic Software, for the Commodore-64.

The folks at Handic Software realize that dependable, bug-free software is a must, but more importantly, they've remembered what some software manufacturers forget: Attached to the outside of the keyboard on the Commodore-64 is a nebulous entity called a user (i.e., you and me). Calc Result is designed for users.

You don't have to be a programmer or a math wizard to harness its power.

When you open the Calc Result package, you will find 70 well-written pages of documentation in a vinyl binder, a program cartridge and a master disk.

Installation is painless. You plug the cartridge into the expansion port and then turn on the equipment. The program will prompt you to mount the master disk, and then execute a routine that I consider to be a good example of professional system design. The program backs up the master disk onto a work disk and instructs you to secure the master in a safe place.

The program formats and copies to the work disk, and prompts for your system configuration and personal choice of background, foreground and border colors. You even have your choice of help screens in four languages out of a total of eight. All this is done for you.

The back-up process requires that you slip the back-up disk into drive 1 (for a two-drive system), or alternate the disks in drive 0 (for a one-drive system), and press the return key a few times.

Calc Result provides plenty of flexibility for data manipulation. Financial or numeric models are built on pages consisting of 254 rows by 63 columns. The intersection of each row and column is a cell that can contain numeric data, a descriptive label or a formula to be calculated.

Each cell can have an individual character format. This gives you unlimited flexibility in page design. Since Calc Result supports up to 32 separate pages, a three-dimensional view of the data you are working with can be created.

Building pages with Calc Result is a snap. You can move the cursor left, right, up or down to scroll the page for viewing. Column widths can be changed instantly, and the leftmost column can be protected and continuously displayed. Formulas, labels and data can be easily replicated in other cells, or changed with little effort by using the edit commands, which, like all commands supported by Calc Result, are only a keystroke away. Entire rows or columns can be replicated, inserted or deleted.

And what can you do with specific data on a page? Nearly anything. Calc Result supports all the normal mathematical functions for building formulas as well as sum and mean value functions. Formulas are built according to normal mathematical rules to further simplify calculations, but the real power of Calc Result comes from logic functions supported. If-Then-Else with And, Or and Not-Else logic functions can be used in each cell. For instance, *If* manufacturing cost of a product is greater than 40 percent of raw materials cost, *Then* retail price should be equal to manufacturing cost plus x percent, *Else* retail price should be equal to manufacturing cost plus y percent.

Once you have defined your formulas, Calc Result lets you define manual or automatic recalculation. In auto mode, any time you change a value on a page, any values related to the changed value will be automatically recalculated and displayed. This gives unlimited flexibility to projected results based on changing data and what-if situations.

If you're like me, and have a memory-retention span of about 30 seconds, you will appreciate Calc Result's split-screen function. You can split the display screen either horizontally or vertically to display different sections of the page. When the screen is split, each half can be scrolled over the whole page separately. A separate page also can be displayed in each screen half, but it gets even better. A window can be defined on the screen that displays a particular section of a page. The window itself can then be split, so it is possible to have parts of four different pages on the screen simultaneously.

If you would rather visualize your calculated results instead of just dealing with numbers, Calc Result will prepare an impressive bar chart of your data in graphics mode.

The chart can be displayed and printed, along with other printed pages. The formatting option in the print routine will let you create custom print formats and make every column a different width if you like.

What About Documentation?

Is the power and flexibility of the program complicated or hard to use? Nope—not at all. The documentation manual provided with Calc Result is divided into three sections: A user's guide, a tutorial and a description of commands and functions.

The tutorial section leads you through the full range of the program's abilities in small easy steps. Rather than being bogged down in complex descriptions of various functions, you will find yourself creating and manipulating cells and data in the first five minutes you spend with Calc Result. The tutorial is task-oriented, and starts you off building pages and learning by doing. It's an enjoyable experience. Once again, Calc Result is a study in what the term "user friendly" should mean. You don't need extra reference manuals to get the most out of the software.

In case you haven't noticed, I really like this software package, but nothing can be perfect. So, (look, look, look, search, search, search) there is at least one possible drawback of which you should be aware.

The program cartridge is an autostart ROM. This means that you plug it in, turn on the power and it comes up by itself without any run commands from you. You end the program by executing the quit command. The program will save the page you are working on to disk even if you forget. It then tidies up, clears the screen, prints a copyright and end message, and then literally goes away.

To restart the program you must power down the computer, and then power it back on. To load or execute any other program, you must power down the computer and pull out the cartridge. This would only cause you problems if you like to switch back and forth between applications without powering off your unit.

On the other hand, at the suggested retail price of $150, it's worth buying a Commodore-64 just to run Calc Result.

The only other problem I've found with Calc Result is simple addiction. I seem to be playing fewer games on my 64 and using Calc Result to create budgets, expense reports and quarterly reports that used to be drawn out, boring projects. With Calc Result, these projects have become so easy that now they are actually fun to do.

The hardware required to run Calc

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Now is your chance to cash in on your robotics programming skill and creativity. Enter the first Microcomputing/Heath Company HERO 1 programming contest and win up to $500 worth of prizes. Microcomputing magazine, in conjunction with the Heath Company, manufacturers of the HERO 1, invites all HERO 1 programmers to submit their best applications to this contest. Entries will be judged in the following categories:

1. Standard HERO 1 with arm.

2. Modified HERO 1, including additional RAM or ROM, as well as any mechanical or electrical modifications.

Prizes will be awarded to the top three entrants in *each* category. Two $500 gift certificates (one from each category) will be awarded. Each first place winner will select the prizes of his choice, worth up to $500, from the latest Heath Company catalog. A $100 gift certificate, good toward any purchase from the Heath catalog, will be awarded to both second place winners. Third place winners from each category will receive a copy of Microcomputing columnist Mark Robillard's new book, "HERO 1 Advanced Programming and Interfacing," plus a one-year paid subscription to Microcomputing magazine.

CONTEST RULES

1. All programs must be submitted both on cassette tape and in hard copy form. A brief, written description of the application must accompany each entry.
2. Entries in the modified category must include a complete description of the alterations performed on the robot.
3. The contest is open to all HERO 1 owners, except employees of Wayne Green Inc. (publisher of Microcomputing), and the Heath Company and and their immediate families.
4. All entries, including programs, become the property of Microcomputing.
5. All entries must be received by Microcomputing by September 1, 1983.

Send submissions to:

Robotics Contest
Microcomputing
80 Pine Street
Peterborough, N.H. 03458

7. Contestants may submit more than one entry in one or both categories.

Entries will be judged on originality and technical feasibility. The more practical and easily adaptable the application, the better. Winners will be announced in the December 1983 issue of Microcomputing. So rev up your robot, and let's put the Heath's HERO through its paces!

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Result is the basic Commodore-64 system. You need a Commodore-64, one or two 1541 disk drives and a Commodore 5151/1525 or 1520 printer.

If you are looking for a dependable, flexible and easy-to-use spreadsheet program, I think you'll find that Calc Result is well worth your investment. *(Handic Software, distributed by Computer Marketing Services, Inc., 300 W. Marlton Pike, Cherry Hill, NJ 08002.)*

Gary McClellan
Flagstaff, AZ

Nevada Cobol

Yes, your CP/M System can run Cobol—and for only $29

Everybody knows that a personal computer can't run Cobol. It takes too much memory, right? Wrong.

Nevada Cobol will run a 2500 statement program under CP/M with just 32K RAM and a disk drive.

Well, surely everyone knows that Cobol is too expensive. Wrong again.

Nevada Cobol sells for $29. No, that's not a typographical error; it's $29!

What Is It?

Nevada Cobol is a version of Cobol that meets the most widely used facilities of ANSI-74, the accepted standard for Cobol. You can buy it from Ellis Computing of San Francisco, a company that specializes in well-documented, bug-free language programs that don't cost an arm and a leg.

You might ask why you need Cobol when you already have Basic. First, it is the language of business. There are thousands of business programs written in Cobol. Many of them are in the public domain and are free.

Second, Cobol is easy to understand. It reads much like ordinary English and is almost as easy to program in. Finally, its file and record structures are designed for business and accounting: its data entry features facilitate generating formatted reports. Who needs an expensive spreadsheet program when you have Cobol!

The biggest difference between Cobol and Basic is that Cobol is a compiled language. This means that you write your program using a text editor, and then save it as a CP/M file with the suffix ".CBL".

You then command "CC filename" and the compiler transforms your program into 8080 object code. Then the resultant program is run, or, more typically, a run-time program is called up to load your program and run it.

This whole process can be frustrating at first, especially if you are used to a very interactive programming language such as Basic; however, as you improve, you find the run speed more than makes up for the little extra time used writing the program.

My version of Nevada Cobol arrived just ten days after I ordered it. This didn't surprise me as I'm used to dealing with Ellis Computing. As usual, it had been properly packaged for Canadian customs—no mean feat. The 153-page instruction book was in a three-ring binder.

Here's what you can expect on your distribution disk:

- CC.COM—the Cobol compiler itself
- W4.COM—a scratchpad file used by the compiler
- W5.COM—the error message file. This is accessible to you, so you can change the error messages to make them more understandable. You can even change the language they're written in.
- RUN.COM—the run-time loader/subroutine library
- ERRORS.COM—This program displays your errors after compilation. I use it a lot!
- RENUMBER.COM—This is the source code for a renumbering program. It must be compiled before it is run so that you have a correct source program to test your compiler.

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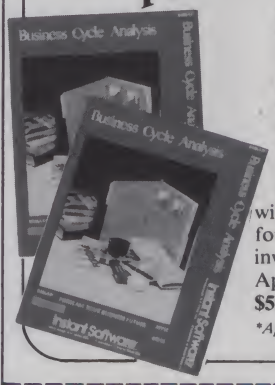

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●CONFIG.CBL—This is another source-code program. It should be run before writing any programs, as it configures RUN.COM for your terminal.

●CONVHEX.COM—This converts ".HEX" files to ".OBJ" files. For the life of me, I can't see why you need it!

The instructions for Nevada Pilot were clear, even to a software reviewer. You are told how to make a current disk from the master. The manual goes as far as to spell out that you enter "PIP A:=B: *.* [VO]"O. Uncharacteristically, Ellis then goes off on a tangent.

Instead of immediately going to the configuration program to set up the run-time package for your particular machine, he describes how to write and compile a program.

Two pages later, you're at the configuration program. CONFIG.OBJ is a program that initializes RUN.COM for your terminal. In fact, RUN.COM will modify itself as it runs. Once this is done, you can erase the configuration program.

Once you have written a source-code program, you must compile it. This is done by entering "CC filename.XXX". The filename must have the CP/M suffix ".CBL" The first X gives the drive your source code is on, the second X the drive the object file is written to and the last X gives the drive to use for a work file. Usually, the compiler will list a batch of errors and terminate the compile. If you are gifted, or lucky, the program will compile and be saved in a file with the same filename and the CP/M suffix ".OBJ".

Finally, you enter "RUN filename". The filename must be the one you earlier compiled. The Run program loads the program into memory and executes it. There are also a number of machine language subroutines in the Run program that are called from your program.

You should practice all these steps using the renumber program, since you know the source code is correct; so, any problems are either yours (most likely) or Nevada Cobol's. You won't waste time with silly syntax errors.

Error messages are much more explicit than those I am used to using on a mainframe. You won't get pages and pages of error messages that were generated by a simple error in the first few lines of your program. This compiler aborts once it sees that an error is being carried through.

All this may sound simple. It is. Whether you are a proficient Cobol programmer, or are using Ellis's business programs written in Nevada Cobol, there's really nothing else you need to know.

If you haven't programmed in Cobol before, the manual is a bit skimpy as a programming course. It wasn't meant as one. You could, however, manage without too much problem.

If you are used to programming in Cobol, Ellis's manual will show you the few differences between this and the full-fledged Cobol. There's a six-page list of all the ANSI-74 reserved words along with the few that are omitted from Nevada Cobol. Omissions are so few I wouldn't bother looking for them. They probably won't show up in your programs for years. So far, the only two problems I have had are that you can't "WRITE AFTER ADVANCING . . ." and Address isn't a reserved word. There are also eight words in Nevada Cobol that aren't in the ANSI-74 standard.

If you write commercial software, Ellis Computing has a good deal about royalties. If you're selling object code, you can distribute the run-time package without paying royalties. Naturally, if you market only source code, you can't distribute the compiler without buying a license from Ellis Computing.

A Tip of the Hat

Although this is a review of Nevada Cobol, I must add a few words about Ellis Computing, the company that markets it. I have been dealing with this company for more than a year. Every letter that I have sent them has been promptly and courteously answered. Every suggestion,

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every complaint and every query has received immediate attention. I haven't found any bugs in this program, but I did find some in a version of Pilot 1 bought from Ellis (see review in January 1983 *Microcomputing*, p. 158).

Chuck Ellis, the president of Ellis Computing, and John Starkweather, the creator of Pilot, both wrote to me with suggestions; soon after, an updated disk arrived in the mail—no charge!

Summary

Ellis Computing has come up with an inexpensive and useful version of Cobol. Professional software writers can use it to widen their markets. Business users will write better programs than they would have with Basic. The rest of us will enjoy it because it is an inexpensive introduction to a rich and useful language. *(Ellis Computing, 600 First Ave., San Francisco, CA 94121.)*

Bruce Evans
Pickering, Ontario

Smartkey

This CP/M utility Redefines your keyboard, Making complex tasks simpler

Microcomputers are supposed to provide relief from the drudgery of repetitive activity, so it's ironic that the opposite often occurs. If you find yourself repeatedly typing an awkward series of commands every time you use a particular piece of software, you know what I mean.

Whenever I load WordStar to write or edit an article or letter, I must type a long series of commands after commanding WS ARTICLE.001<cr> to configure it to my customary starting parameters:

^JHO	(set help level to zero)
^OJ	(turn off justification)
^OH	(hyphen help off)
^OR75<cr>	(right margin at 75)
^OT	(screen "ruler" off)
^V	(insert off)

[The symbol ^ means the character following is a control character; <cr> stands for RETURN.]

This is particularly awkward, because I must wait until WordStar is loaded, and then issue these commands slowly enough for WordStar to be able to keep up while it's trying to display all sorts of start-up prompts I don't need or want.

Smartkey to the Rescue

Smartkey lets you redefine your computer's keyboard, key by key. You can define one key to produce long strings of commands like all six of those WordStar initiation commands. I've redefined the tilde key ~ so that it generates the string

^JHO^OJ^OH^OR75<cr>^OT^V

This is contained in a key redefinition file I use only with WordStar, so now my WordStar initiation procedure is this:

```
SK WS <cr>
WS ARTICLE.001 <cr>
~
```

The first line loads Smartkey and the key redefinition file WS.DEF. The second line invokes WordStar in document (non-programming) mode, set to work on the file ARTICLE.001. The third line, entered after WordStar is loaded, generates the 21 keystrokes of the initial command group, and I'm in business.

Since that particular long command string is likely to be issued only once per session, it may seem of limited value, but there's great satisfaction in not having to retype it every time I load WordStar. (In passing, it should be noted that your WordStar supplier can preconfigure your WordStar master to come up initialized to your specifications.

On the other hand, you probably can't judge that before you've used the program, and you may want different initializing for different applications, which Smartkey can do by single keystrokes defined in one or more *.DEF files.)

As helpful as Smartkey can be in word processing, it pales to insignificance when compared to its value in database entry.

There are other Smartkey commands, used much more repetitively, that save me multiple keystrokes. The best WordStar example is

^KS	(save file & restart)
^QP	(return cursor to position before save)

By defining the \ key as ^KS^QP, I can save my existing file and return the cursor to position by hitting the \ key. It's particularly handy when going through a long article making word changes. Since the temporary save is advisable as a frequent protection practice, this is not only convenient but an encouragement to protect my work from possible loss.

Help for Newcomers

Other key redefinitions are useful in WordStar, too. When I introduce a computing newcomer to word processing, little things can get in the way. On most computer keyboards, hitting the period while the shift lock is on produces the greater-than sign >, and uppercase on the comma key is the less-than sign <. No typewriter keyboards are set up this way, and high-speed typists can be stopped cold when striking a capital ".", only to find ">" on the screen.

So whenever I have a beginner demonstrate word processing to himself, I first load Smartkey and a special redefinition file, WS1.DEF, which automatically converts ">" to "." and "<" to ",". Since high-speed typists almost never have occasion to use < or > (they don't appear on many office typewriters), the keys aren't missed—and the frustration of getting unexpected results is avoided. Later—after the joys of word processing have captured interest—it is time to introduce exceptions like < and >.

As helpful as Smartkey can be in word processing, it pales to insignificance when compared to its value in database entry.

Imagine the task of copying names and addresses from a manual card file into a computer database—something faced at least once by every organization moving their mailing list to a computer. Usually, the raw material comes to the typist in sensible order, often presorted by zip codes, since that's the way the post office prefers to get bulk mailings. This means the operator will type a given city name, state and zip code dozens—perhaps hundreds—of times.

This is where mistakes creep in, since most typists get sloppy on, and pay little attention to, anything they're typing for the 35th time. Having done it, I can testify to the intense boredom of typing Cassadaga NY 14718 or Ocala FL 32671 over and over again as the last part of dozens of entries. (I choose "Cassadaga" as an example because it's all left-hand typing and has error-encouraging keystroke combinations like "assada.")

Because Smartkey offers a capability for redefining keys on the fly, while running a particular application program, the operator can redefine a key (the ! key, for example) as a new city name, state and zip code when it is first encountered, proofread it once, and never type the combination again. The redefined combination can even end with the carriage return and whatever other characters may be required to move on to the next database entry.

Even when entering names and addresses from one city with varying zip codes, there's an advantage. If the key @ (which almost never is needed for entering addresses) is redefined as New York NY 100, the operator can add on the last two numbers of the zip code and still avoid repetition.

The same tactic applies, of course, to multiple appearances of a name like Smith or Wilson. And since each database entry requirement has its own peculiar set of time- and effort-saving opportunities, I'll leave the possibilities to your imagination.

Basic Programming

Writing programs, of course, is full of repetitive keystroking. How many times did you type CHR$(last time you wrote a Basic program?

Smartkey lets you create a permanent key redefinition file that defines spare keyboard keys as the reserved words of Basic, so you need not type them repeatedly once you are familiar with them. But you also can redefine other keys as variable names. So typing the plain-language variable name NUMBEROFPLAYERS becomes a one-keystroke matter.

Using ED

I almost never use the CP/M editor ED.COM, but there's one task it handles particularly well. When a Basic program under development gets too large to run in available memory with comments intact, I create a TEMP.BAS version with comments stripped away. The ED command #J'^Z^Z^L^Z<cr> quickly deletes all comments following ' on a line, while leaving the line number intact in case it's a jump target. (You'd use #JREM^Z^ Z^L^Z<cr> if you use REM to identify REMarks.) I seldom remember the command syntax when I need it, so by having this command macro handy under the right brace (}) key, I can strip a heavily commented program easily:

```
A>ED PROGNAME.BAS
*#A
*}
*E
A>
CP/M Commands
```

If you frequently back up your work by commanding PIP A:=B:FILENAME-.TYPE<cr>, you can avoid all those mistake-prone keystrokes involved in typing the combination "A:=B:" (some uppercase, some lower) by redefining a key as all or part of that combination—as just PIP A:=B: if you switch filenames from time to time, or as the whole combination right through the carriage return.

Special Keyboards

If you have a keyboard with a lot of extra function keys, you can imagine the endless time-saving possibilities Smartkey offers. In particular, if you're developing software for less experienced people to use on a family of similar terminals, you can "hand-hold" the entire application, providing labeled, defined keys for every important function or combination of functions.

Putting it to Work

It's a simple matter to put Smartkey to work on your system . . . far simpler, as it happens, than its manual suggests (more on that later). After you've made a copy of the master disk, you interact with just three programs to get things rolling:

- SKPATCH.COM is used to tailor Smartkey for your system.
- SMARTKEY.COM, once tailored, is loaded and runs all the time.
- FIXKEY.COM allows you to save or switch redefinition files during a session.

Documentation

Smartkey's manual is its weakest link. It needs more straightforward examples, less fuss over exceptions in main sections and clearer discrimination among functions of SKPATCH.COM, SMARTKEY-COM and FIXKEY.COM.

The distributor tells me the manual is being revised. That process should be complete by the time you read this.

Fortunately, once you've set it up, Smartkey is so easy to use that you can ignore the manual as long as you remember two items.

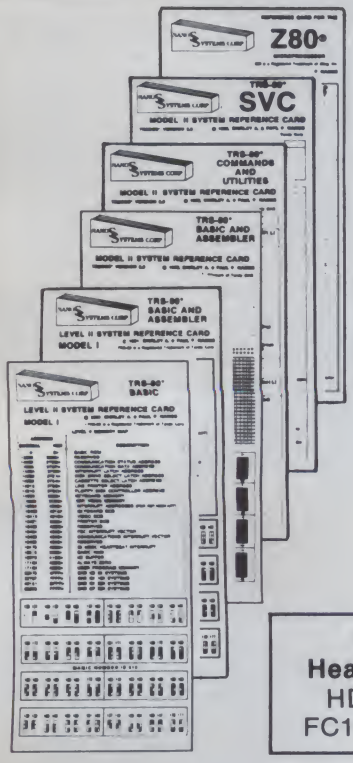
First, that you invoke Smartkey with a special definition file by commanding A>SMARTKEY SPECIAL<cr> or your shortened versions of the name Smartkey and the name of your own SPECIAL .DEF file, such as A>SK WS<cr>.

Second, you should remember that your special escape character is in any version you've set up, keeping in mind that it can be a different character for each application program you use with Smartkey.

Summary

Once running in your system with redefinition files worked out, Smartkey is a time, error, effort and frustration saver. It's well worth the cost, particularly if you do much database entry work or extensive word processing with software that uses command strings. You could end up wondering how you got along without it. *(Heritage Software, 2130 S. Vermont Ave., Los Angeles, CA 90007. $60.)*

Dick Lutz
New York, NY



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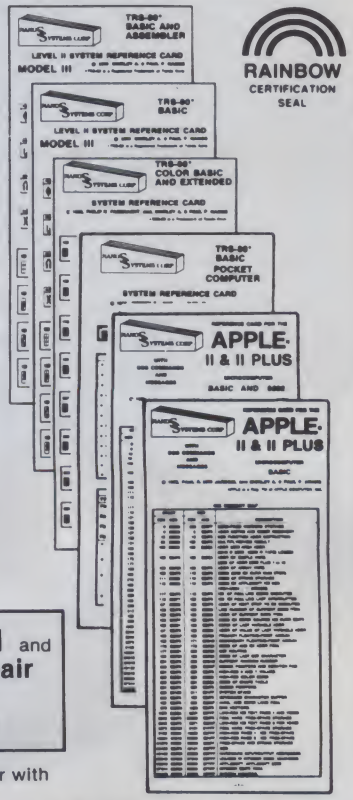

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Quick File

This Apple III database Takes the simple approach To keeping you organized

Most of us could benefit from having better organization of personal data files, be they as mundane as Christmas card lists and recipe files, or as esoteric as a catalog of books about 19th century mining technology.

I had put off organizing my small files for lack of an affordable, easy-to-use card file program. When my employer purchased a number of Apple III Professional Solution systems, I had the opportunity to become acquainted with Apple's fine program, Quick File.

Quick File is designed to permit you to quickly create a file and to generate custom reports without spending much time in the learning process.

My secretary found the Quick File system to be so convenient that she now uses it to maintain lists of our department's files, the status of our current projects and addresses of attendees at industry meetings.

Our accounting department uses Quick File to prepare a report of checks that have been voided during the month. At home, I use Quick File for addresses and for tracking the status of various magazine articles and software that I write to supplement my income. In short, Quick File has proven to be very useful.

Quick File features menu-driven operation, so you don't have to remember complex commands. It is designed for an Apple III system with at least 128K and two disk drives, the second of which can be a hard disk.

The software is supplied on two disks. One is a boot disk and the other contains the program. A third disk, containing sample files, is included for use with the tutorial. To use the program, you first name the file and then define the categories of information to be contained on each card image. Up to 15 categories, each with names up to 20 characters long, may be defined per card.

Once the blank card image has been defined, data can be entered by tabbing back and forth through the fields, entering data as desired. Completion of data entry on one card evokes another blank image to be filled in. Errors in data entry are corrected by using the cursor control keys to move to the offending portion. You then type over the error.

Categories can be deleted, and new ones can be inserted.

As each new image is completed, you are informed of the total card images already in memory and the amount of additional images that may be entered without running out of room. For a file with a 75-character average-record size, a 128K Apple III will hold 250 records per file. A 256K Apple III will accommodate 1200 records of the same average size.

Much of the usefulness of Quick File stems from the programmer's use of the Open Apple key on the Apple III. Like the shift key, or the control key, the Open Apple key is used to add functions to other keys. For example, by typing Open Apple-H, you can peruse the help screens that explain all the options available at the current position in the program.

Open Apple-Z "zooms" between the card image and a broader view of the whole file, in which each card's information occupies only one line of the text screen.

In this overview mode, you can quickly scan through the file to any particular card and then zoom in to look at the detailed contents of the card. By similar use of the Open Apple key, you can sort the file on any field into either ascending or descending, alphabetical or numerical, sequence. Record selection criteria can be entered so that only qualified card images are displayed.

The report writing features of this program are unique. The Open Apple key is used to effect formatting, permitting widths of fields to be easily changed. Categories not needed on the printed report may be deleted for reporting purposes, but remain in the data file for use in other reports.

You can shove the various columns around, changing their order as needed, until the report screen looks correct. The report format can be saved for future use. Up to three selection rules can be entered for each report in order to restrict the reporting to images meeting specific criteria. Column totals can be calculated and decimal positions to be printed can be specified. Reports can be printed to either the screen, a file, or to a printer.

Quick File permits easy entry of printer control set-up commands into a report file so that whenever the report is run, the set-up commands will not need to be reentered. Page width, length, margins and spacing of lines can all be customized easily. Report pages are automatically numbered.

The documentation is supplied in a spiral-bound book, which is the same size as the documentation supplied with other Apple software for the Apple III. The printing is clear and the screen images portrayed are the most legible of any I've seen from Apple. Rather than calling the documentation a manual, Apple has chosen the appellation (sorry about that) "Sampler" for the tutorial-style book.

By following the book's instruction, even a microcomputing novice soon can learn to whip through the sample files provided on the third disk, adding records, arranging the files and generating reports. After familiarization, new users are shown how to create files of their own. A reference section, index and summary card finish off the book.

Quick File does have limitations, all of which reflect the compromises associated with holding the entire file in machine memory while manipulating the file. With a 15-category limit for each record, Quick File is not suitable for complex filing jobs. Disk-based systems like PFS permit each record to contain several pages of categories and data. However, the disk-based programs cannot sort or select certain records as quickly as an "in memory" program like Quick File.

(Continued on p. 140.)

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